AFTER GREAT DISASTERS

An In-Depth Analysis of How Six Countries Managed Community Recovery

Laurie A. Johnson and Robert B. Olshansky

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Library of Congress Control Number LCCN 2017002417 (ebook)

ISBN 9781558443327 (prc) | ISBN 9781558443334 (epub) | ISBN 9781558443341 (ibook) | ISBN 9781558443358 (pdf) | ISBN 9781558443310 (pbk)

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1 Introduction

Evolving Approaches to Managing Recovery from Large-Scale Disasters

Imagine for a moment that you are a political leader—a prime minister, president, or governor—and you are awakened to the news that a natural disaster has struck. Citizens have died, buildings have collapsed, infrastructure is hobbled, and local leaders desperately need additional resources and support. You respond immediately, sending personnel and equipment to the disaster zone and pledging additional assistance to local leaders.

Yet within days, even hours, before all the casualties are treated and before the streets have been cleared of rubble, other leaders and the media are demanding answers to questions you have not had time to consider: How much money will be pledged to rebuilding? What standards will guide it? Will all landowners be permitted to rebuild? Will there be enough housing for renters? How will the local economy be reconstructed? Who will lead the process? Is a new institution or governance structure needed to cut through bureaucratic red tape and expedite the rebuilding?

This book synthesizes two decades of research on the roles of various levels of government in successful disaster recovery and rebuilding after some of the largest disasters in the United States, Japan, China, New Zealand, Indonesia, and India, as well as observations in several other countries around the world. This research involved collecting hundreds of documents and interviewing countless government officials, academic researchers, representatives of international aid organizations, community

Hurricane Sandy damaged many homes along the New Jersey shore after making landfall there on October 29, 2012. Photo by Laurie Johnson (2013).

leaders, and disaster survivors with the aim of finding common lessons in these disparate environments and facilitating the recovery of communities struck by future disasters.

THE PROCESS AND MANAGEMENT OF POST-DISASTER RECOVERY

Large disasters are rare. When they occur, however, their aftermath can change the fortunes of a city or region, for good or for ill. Chicago and San Francisco became more successful cities after being ravaged by fire and earthquake, respectively, and Tokyo successfully survived devastating fires caused by earthquake and war. But the city center of Managua, Nicaragua, never recovered from a 1972 earthquake, and Galveston, Texas, lost its importance after destruction by a great hurricane in 1900.

Management of recovery matters because disasters extend over time. They disrupt lives and businesses as people await assistance, infrastructure repair, and the return of their neighbors. Physical recovery from disasters

takes many years, and the psychological scars can last for decades. Many people survive the initial disaster but then suffer from the recovery as the economy stagnates, social networks weaken, and healthcare and support services decline. The process of recovery is a major aspect of a disaster, and its management can affect both the intensity and the duration of citizens' disaster experiences. Post-disaster reconstruction offers a variety of opportunities to fix long-standing problems by improving construction and design standards and construction quality, renewing infrastructure, creating new land use arrangements, avoiding hazardous locations, reinventing economies, improving governance, and raising community awareness and preparedness.

Until now, there has been little systematic understanding of how to make recovery work. When a catastrophic disaster strikes, the leaders of the affected communities often recognize that they lack relevant experience, so they seek lessons from others. Typically, they muddle through, innovate, and learn as they go. But, in the end, most agree that if they had known then what they have since learned, their recovery could have been faster and easier. Increasingly, in our globalized and connected world, affected communities benefit from assistance from those who have experience with recent disasters in other parts of the world. Given this growing collection of disaster recovery experiences, the time is ripe for organizing and synthesizing common lessons.

In the past 40 years, a number of serious international disasters have required large-scale, sustained intervention by multiple levels of government and nongovernmental organizations (NGOs), and their responses have increased our knowledge of long-term post-disaster reconstruction. We now have enough examples to develop transferable theories about the process of rebuilding human settlements after disasters.

Recovery as a Process

Reconstruction Following Disaster was the first comprehensive, long-term study of disaster recovery (Haas, Kates, and Bowden 1977). Its authors studied rebuilding after the 1906 San Francisco, 1964 Alaska, and 1972 Managua earthquakes, among other disasters, and described recovery as

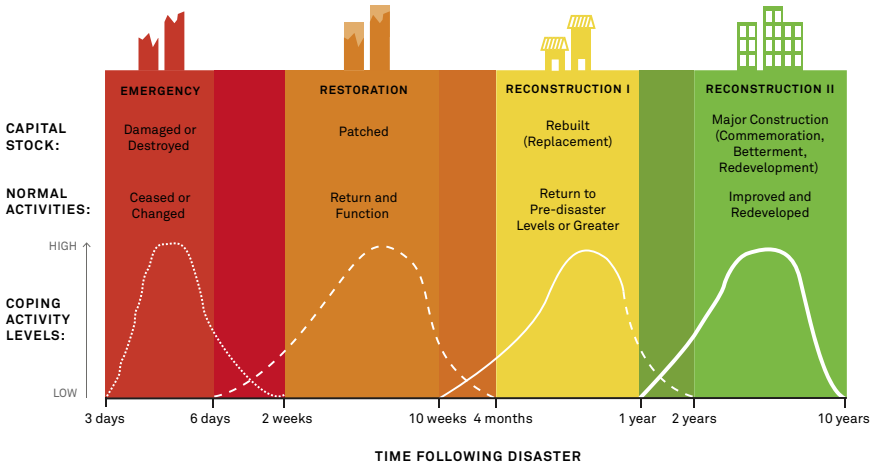


FIGURE 1.1. Disaster Recovery Timeline
A model recovery timeline first proposed by Haas, Kates, and Bowden identified four overlapping periods of recovery-related activities, each lasting significantly longer than the previous ones. *Source*: Based on Haas, Kates, and Bowden (1977).

an ordered, knowable, and predictable process in which there is a strong community desire to return to normalcy after a disastrous event. They proposed that recovery progresses through four distinct but overlapping periods—emergency, restoration, replacement reconstruction, and major reconstruction involving betterment and commemoration (Haas, Kates, and Bowden 1977, xxvi–xxviii; see figure 1.1).

Although subsequent scholars have questioned this ordered, sequential model of recovery, *Reconstruction Following Disaster* still contains considerable wisdom. In particular, its authors estimated that it takes more than two years to attain pre-disaster levels of capital stock and activities, and it can take ten years or longer to complete major reconstruction. In other words, restoring and rebuilding what existed before the disaster are much faster than changing land uses and urban patterns and reconstructing differently in the wake of a disaster.

Haas, Kates, and Bowden described a post-disaster tension between change (including risk reduction) and a return to normalcy. "There is already a plan for reconstruction, indelibly stamped in the perception of each resident—the plan of the predisaster city. The new studies, plans and

designs compete with the old" (Haas, Kates, and Bowden 1977, 268). Rosen (1986), using the cases of Chicago, Boston, and Baltimore, demonstrated the reasons change is difficult after disasters, despite public intentions for betterment: multiple stakeholders with property interests, a complex web of incentives embedded in real estate markets, structural and topographic constraints, and competition among numerous public and private interests for finite urban space. Haas, Kates, and Bowden also cautioned that taking too long to plan can cause uncertainty that will be counterproductive in reviving the functions of a city, and that most people will begin to recover regardless of plans.

Although numerous publications outline recovery processes and policies for single disasters, relatively few since Haas, Kates, and Bowden have undertaken comparative studies that synthesize management lessons from multiple disaster recovery experiences. Another comparative approach is to describe recovery from multiple stakeholder views, thereby illuminating the realities of post-disaster recovery, but these types of studies also are rare.

In 1990, William Spangle and Associates organized the "International Symposium on Rebuilding After Earthquakes" and summarized its findings in a 1991 publication (William Spangle and Associates 1991). Although its authors' presentation was not quite as orderly as the model of Haas, Kates, and Bowden, they identified seven rebuilding activities: clearance, rehousing, restoration of infrastructure, business recovery, replacement of public facilities, planning, and overall rebuilding effort. They observed that these activities cluster in time—in the first week and at one month, six months, and two years—with rebuilding continuing for many years. In all nine of their case studies, significant rebuilding was completed (with or without plans) in most cities by the second year of recovery, but rebuilding in the most problematic areas (city centers, areas with geologic problems, and controversial areas) required a decade or more to complete.

More than 30 years after its publication, *Community Recovery* still stands out as the first—and possibly only—U.S. study to look at governmental organization and recovery at the community level (Rubin, Saperstein, and Barbee 1985). The authors examined 14 disasters throughout the United States caused by an array of agents. In contrast to the study of

Haas, Kates, and Bowden, none of these were catastrophic disasters, and the research covered only the first 12 to 24 months after each event. Observing that recovery activities do not occur in the sequence of Haas, Kates, and Bowden's model or any other logical sequence, Rubin, Saperstein, and Barbee proposed that recovery is a complex process with an ill-defined endpoint and no standard measure of success. They set out to systematically study intergovernmental roles in recovery, and they hoped to measure recovery outcomes. Instead, they found that recovery is an ongoing process rather than an outcome, and that they should "stop procrustean attempts" to try to quantify it (Rubin, Saperstein, and Barbee 1985, 13).

Communities as Systems of Systems

Increasingly, scholars are describing communities as self-organizing systems "that adapt to change and increase in complexity through time without being guided or managed by an outside source" (Alesch, Arendt, and Holly 2009, 18). In both normal and post-disaster times, city building involves many individuals, organizations, and institutions. Participants act according to their own needs, constrained by the historic artifacts of infrastructure and property values within contexts of the physical environment, economic issues, social forces, interpersonal relationships, and politics. All the actors plan, communicate, and act at the same time as they try to restore housing, livelihoods, community infrastructure, and the economy.

Recovery happens, say Alesch, Arendt, and Holly, when the community repairs itself as a functioning system, and likely a system that is different from the original one. Furthermore, segments of the community will recover at different rates; some may not recover at all. Because the chain of post-disaster events is difficult to predict, the most important quality of a community is its ability to adapt to changing circumstances. Although the extent of the damage and the availability of financial and human resources are important, Alesch, Arendt, and Holly say that communities with a high collective efficacy—those who see themselves as self-organizing and not reliant on others—are most likely to recover.

The phenomena of complex community systems described by Alesch, Arendt, and Holly are amply illustrated by Rosen (1986) in Chicago, Boston, and Baltimore and by Mammen (2011) in his account of the slow and fitful recovery of Lower Manhattan after the September 11, 2001 terrorist attacks. Mammen lays out all the different public and private actors and their interactions over time within the constraints of larger contexts of state and national politics and economies. He also echoes Alesch, Arendt, and Holly's identification of self-organizing adaptation as the key to recovery success: "Recovery efforts will have adapted to new circumstances in terms of the economy, demand for office space, and availability of credit" (Mammen 2011, 249). Mammen argues that the moments of success in New York after 9/11 were due to "creativity; new partnerships and institutions; adaptation; and leadership of all kinds, sometimes from surprising places" (2011, 249). He suggests that successful recovery requires "strong intergovernmental re-

The "Info Gap," developed by students at the University of Technology, Sydney, is one of many temporary art exhibits erected on vacant sites in the heavily damaged downtown of Christchurch, New Zealand, after the February 2011 earthquake. Photo by Laurie Johnson (2012).

lations; a robust nongovernmental sector; an open, critical and inquiring free press; leaders with experience in all sectors including government, business and nonprofit organizations; an engaged citizenry; and a willingness to take risks and make mistakes" (Mammen 2011, 249).

Clear as Mud: Planning for the Rebuilding of New Orleans (Olshansky and Johnson 2010) details the reconstruction decision processes in the city of New Orleans during the first three years after Hurricane Katrina. Like accounts by Mammen, Rosen, and many others, the book describes multiple stakeholders—using plans as an arena and a means to express their needs—operating in historical contexts of racial tensions, corruption, flood-control controversies, and all the usual politics of major cities. Everyone recognized the recovery as an opportunity to pursue improvements, but there was little consensus about what would constitute betterment. A major challenge for New Orleans has been that it has lacked the internal qualities identified by Alesch and Mammen (as well as by Rosen in the case of Baltimore) as necessary for successful recovery.

A Decentralized Process of Self-Organizing Systems

The term *recovery management* is shorthand for something more complex: a decentralized process that involves organization, coordination, and communication among a variety of organizational actors. Rubin, Saperstein, and Barbee (1985) point to the need for strong coordination among multiple levels of governmental and nongovernmental organizations. Smith and Birkland call this the disaster recovery assistance framework, which is "a fragmented network of different stakeholder groups who provide disaster recovery assistance" (2012, 148).

Rubin, Saperstein, and Barbee called for higher levels of government to deliver assistance to local officials in a more collaborative way. Twenty-seven years later, Smith and Birkland asked for the same. They said that it is an "inaccurate assumption that federal and state governments are the sources for most of the resources needed post-disaster" (Smith and Birkland 2012, 152), and that "when community members are actively engaged in formulating a disaster recovery strategy . . . they are empowered to act rather than play the role of passive 'disaster victims' on whom assistance is

imposed" (Smith and Birkland 2012, 156–157). They concluded that "moving from hierarchical, rule-bound systems of disaster recovery to networked, cooperative, nonhierarchical systems could, if adopted, significantly improve recovery processes and outcomes after major or 'catastrophic' disasters" (Smith and Birkland 2012, 164).

Because recovery is a process rather than an outcome, it is best accomplished at local levels of government. Assistance—money, manpower, and information—from outside sources and from higher levels of government is vital, but it should be designed to empower recovery actors rather than prescribe recovery actions. This is like an ecosystem of builders being fed from outside with resources in the form of money and information (Olshansky, Hopkins, and Johnson 2012).

All of this resonates with Innes and Booher's (2010) description of resilient communities. Their work, based on studies of regional environmental problem solving, concludes that resilience as a quality of a social system is about process rather than endpoint. A resilient system, they say, is a self-organizing, complex adaptive system with networks; distributed decision-making, monitoring, and feedback systems; respect for stakeholder opinions; and governments that mobilize actors and facilitate the process.

The Role of the Government

The government is not the only actor in recovery, but it is an important one. It is uniquely positioned to mobilize financial resources, provide technical assistance to public and private actors, invest in infrastructure and public facilities to catalyze private development, act as a credible data repository, serve as a focal point of communications, and provide leadership that can support and further the actions of all the other recovery actors.

DISTINGUISHING RECOVERY FROM NORMAL TIMES

What is unique about post-disaster recovery compared with normal community management processes and city building? Every detailed account of reconstruction decision making after disasters—especially great

disasters—describes chaos and confusion among participants. Rosen (1986) describes the challenges of achieving political consensus on improvements while owners are simultaneously rebuilding or making location decisions (while, in turn, being influenced by the location decisions of others). *Clear as Mud* refers to "the planning equivalent of trying to travel faster than the speed of light" and observes that "everyone had to plan at a pace that was faster than the flow of information the process needed" (Olshansky and Johnson 2010, 223). Furthermore, "some strategic decisions were based on understandings from circumstances that no longer had any bearing on what was really going on" (Olshansky and Johnson 2010, 223). People often describe a sense of disorientation, of operating in an abnormal and foreign environment.

Time Compression

The key characteristic that distinguishes post-disaster conditions from normal times is the compression of time (Olshansky, Hopkins, and Johnson 2012). "Stated simply, the post-disaster environment consists of a compression of urban development activities in time and in a limited space" (Olshansky, Hopkins, and Johnson 2012, 173). Other researchers describe time compression as only one of the characteristics of post-disaster recovery, but it is the overarching characteristic and, therefore, is the key to understanding recovery. It explains most of what distinguishes post-disaster recovery from normal times. Furthermore, time compresses unevenly across various physical, social, economic, and institutional systems in communities. Post-disaster recovery takes place in a different world where the community does not function as it does in normal times or in normal places (figures 1.2 and 1.3).

Time compression especially affects the flows of information and money, the two media that support and connect recovery actors. For example, under time compression, those with the most direct access to financing will gain more than others after a disaster; inequities thereby will increase. Different sources of funds—savings, private financing, insurance, and grants from a variety of governmental programs—flow at different speeds that differentially affect the targets of those funding categories. Bureaucratic processes

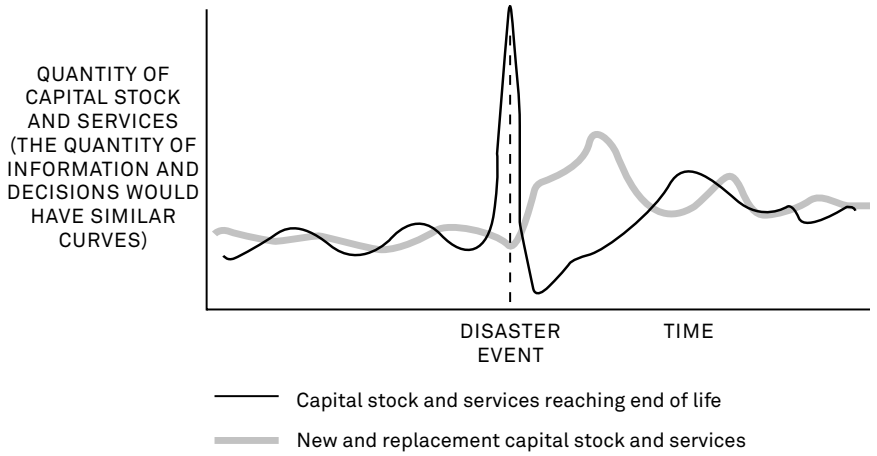


FIGURE 1.2. Impact of Disasters on Capital Stock and Services
Normal processes of replacing capital and services (thick line) that have reached the end of their useful life (thin line) compress in time during and after disasters. *Source*: Based on Olshansky, Hopkins, and Johnson (2012).

that require approvals at several levels do not compress easily, whereas informal information channels can quickly create cooperation among neighbors; in this way, self-help can more quickly facilitate reconstruction than can governmental assistance. The widely observed emergence of nongovernmental organizations after disasters is another manifestation of differential time compression. New organizations emerge to provide the technical and communication services that governments cannot.

The Tension Between Speed and Deliberation

One of the central characteristics of recovery is the tension between speed and deliberation: between rebuilding as quickly as possible and slowing down to develop new plans for betterment. In practice, because many actors are trying to rebuild as quickly as possible, speed is hard to resist. The key is to deliberate more efficiently within the constraints of compressed time.

One solution is to carry out most urgent actions first and then to turn attention to decisions that require more deliberation. Another is to increase planning capacity by adding personnel or technical assistance to the

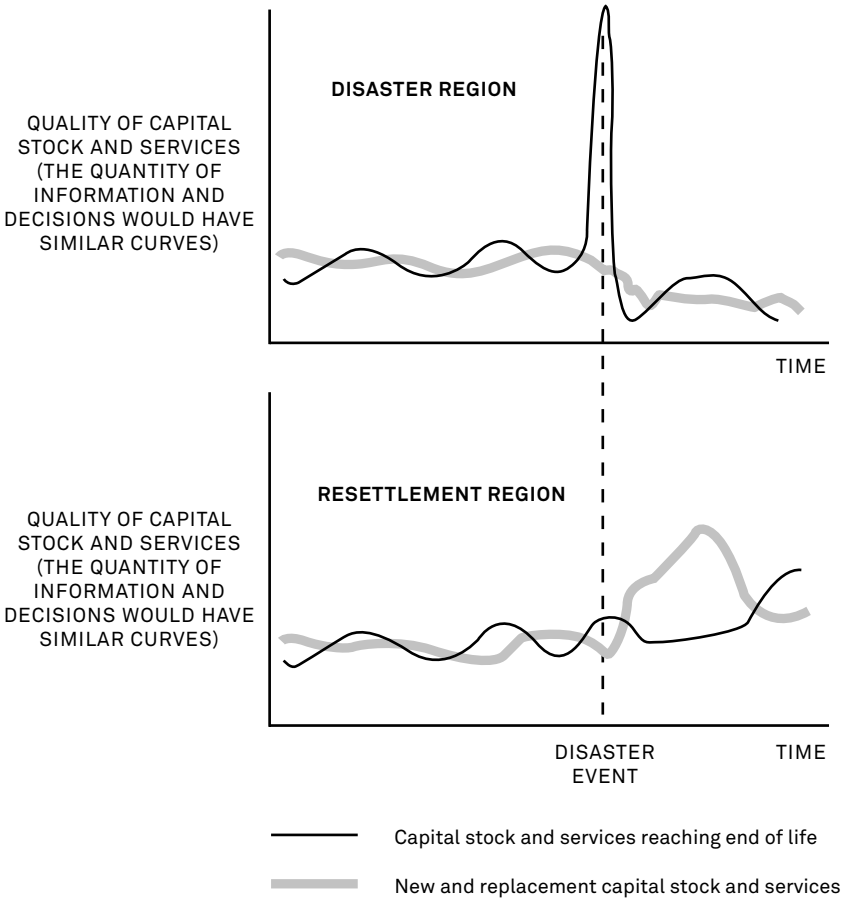


FIGURE 1.3. Differential Impacts of Disasters on Capital Stocks and Services
Loss and replacement of capital stock and services may not occur in the same regions. The disaster region shows a significant loss in capital stock and services, while the resettlement region experiences a significant increase in new and replacement capital stock and services. *Source*: Based on Olshansky, Hopkins, and Johnson (2012).

planning process. A third solution is to decentralize and create multiple paths for simultaneous recovery planning and decision making.

Time-compression phenomena have important implications for institutional design for post-disaster recovery. The rate of communication in all directions must increase because the flow of governmental funds speeds up in compressed time. The solution is to create new institutions or to adapt

existing ones to increase the number of communication channels or their bandwidth. These new institutions will coordinate existing organizations and distribute capacity for simultaneous decision making. Another challenge after disasters is to provide funds quickly and transparently. The speed and volume of information flows after disasters make many transactions opaque, and this opaqueness risks undermining trust among recovery actors. Therefore, funding recipients must be willing to accept less transparency than in normal times, endure delays, or spend resources on increasing communication channels. Funders may need to pay now and audit later.

THE ROLE OF PLANNING AND PLANNERS

Plans and planners play critical roles after disasters. All the recovery actors—individuals and organizations—need plans to guide their actions and persuade others to support their decisions financially, politically, and bureaucratically. Government-sponsored plans can make the case that recovery is a good investment for homeowners, businesses, outside investors, and higher levels of government. Plans can assure investors that their money will be well spent on programs and projects that were chosen from a large range of options through transparent, data-driven processes and will produce desirable outcomes that further the community's goals. Recovery plans should address the desired physical outcomes of a city's recovery and the processes that a city wants to put in place for management structure, policies, and procedures.

Time spent planning or deliberating after a disaster, however, can slow the reconstruction process. Although consensus is critical to successful planning, inclusive deliberation takes time, which is a scarce resource after a disaster. As described earlier in this chapter, three ways to address this tension between speed and deliberation are focusing on urgent actions first before turning to decisions that require more deliberation, increasing planning capacity, and decentralizing. Another way is to rely on pre-disaster plans. Plan implementation will occur more quickly if a locality has active planning institutions and functions in place before disaster strikes. Pre-disaster plans can improve the speed and quality of post-disaster decisions

After Hurricane Katrina in 2005, the Unified New Orleans Plan involved residents in citywide congresses to discuss their overall vision. Groups also worked in smaller settings to identify priorities for neighborhood recovery. Photo by Laurie Johnson (2006).

by providing a vetted vision and rationale for strategies, policies, and programs. Furthermore, localities may find that a disaster can create opportunities to implement pre-disaster policies that could not be realized before the disaster (Spangle Associates 1997).

But many communities affected by disasters lack previous planning. For them, another approach is to accept that planning is a continuous, ongoing process throughout reconstruction. Planning can inform reconstruction, but it need not stop it. Designing collaborative processes and information flows can help add intelligence to reconstruction projects that are otherwise proceeding as rapidly as possible.

Finally, another approach is to "slow down to speed up." Some scholars have observed that time spent on planning and consensus building after a disaster can result in reconstruction processes that are less contentious, better for more stakeholders, and faster to complete (Chandrasekhar, Zhang, and Xiao 2014, 381). Once the stakeholders agree on the plan, they can simultaneously take action and help accelerate the process. After all, recovery is a collective-action process requiring multiple, simultaneous actors.

THE CASES

This book presents cases of countries that have faced the challenges of recovering from large disasters: China, New Zealand, Japan, India, Indonesia, and the United States. The cases treat countries rather than individual disasters because it is important to understand the national contexts and the unique historical evolution of recovery policies in each country in order to identify generalizable lessons. Each case study addresses the following:

- The context in which post-disaster management structures are created (the legal and policy framework for disaster management, multilevel governance and authorities, and political and historical contexts that significantly influence the recovery process).
- The time at which recovery management structures and organizations are created (pre- or post-disaster aspects, key external events, and triggers).
- The governance structure and decision authority of recovery management organizations (the level of government at which they operate, the type and scale of coordination they provide, and the scope of their authority).
- The substantive goals of the recovery management organizations, their accomplishments over time, and the evolution of recovery policies and priorities.

The cases featured here provide models for leaders and organizations to use in their institutional design and recovery management. It is this perspective—that of government agencies that are concerned with urban development, acting within the complex contexts of post-disaster recovery—that is most important. Governments, however, are not unitary actors but consist of many agencies at multiple jurisdictional levels. In post-disaster recovery, intergovernmental cooperation becomes more critical than ever because each level of government has an important role to play. The question is: How can multiple levels of government effectively manage post-disaster recovery and reconstruction, meeting time-sensitive needs while also maximizing the opportunity for community betterment? The cases represent various management approaches within governmental contexts. They

examine the themes of money, information, collaboration, and time, which encompass the critical processes and flows negotiated by recovery organizations. Each case of recovery management falls into one of the following categories:

- Centralized: The national government led and controlled the overall recovery management and policy creation (China and New Zealand).
- Partly decentralized: Organizations at multiple levels of government managed recovery and policy making under tight coordination by the national government (Japan).
- Decentralized: Many different organizations at multiple levels of government managed recovery and made policies, and the national government provided some coordination and support (India, Indonesia, and the United States).

By analyzing a broad range of international cases, leaders can make recovery management and decision-making processes faster and more effective.

2 China

Top-Down, Fast-Paced Reconstruction

The 2008 Wenchuan earthquake dramatically affected a large part of western China. The speed and volume of the reconstruction process were unique among large-scale disasters. The strengths and weaknesses of China's approach can be evaluated to provide insights into governmental coordination of large-scale recovery and high-speed reconstruction during a time of extraordinary urbanization and land use change. A summary of the recovery after the catastrophic Tangshan earthquake in 1976 reveals that the post-earthquake experience influenced the 2008 recovery policies. In addition to a variety of secondary sources, this chapter is based on a multiyear study of China's recovery process.[1]

PRE-DISASTER INSTITUTIONAL AND POLICY SETTING

At the time of the 2008 Wenchuan earthquake, China had several laws that addressed disasters, but there was no single law structuring the response process (Zhe 2008). In 2005, China established the State Disaster Relief Commission with approximately 25 members from State Council (central-government) agencies headed by the vice premier. According to *China Daily*, the commission "is responsible for mapping out the nationwide plan for disaster prevention and relief works," and it coordinates government response (*China Daily* 2008c). The China State Council approved the 11th Five-Year Plan on Comprehensive Disaster Reduction for implementation

on August 5, 2007, which included numerous initiatives for both disaster response and prevention (J. Hu 2009).

Hazard management and response are handled mostly by central-government departments, such as the State Flood Control and Drought Relief Headquarters, the State Headquarters for Earthquake Resistance and Disaster Relief, and the State Headquarters for Forestry Fire Prevention (Yi et al. 2012). Long-term recovery and reconstruction fall under the national and provincial ministries of civil affairs. The government repairs infrastructure, and residents rebuild homes with government assistance.

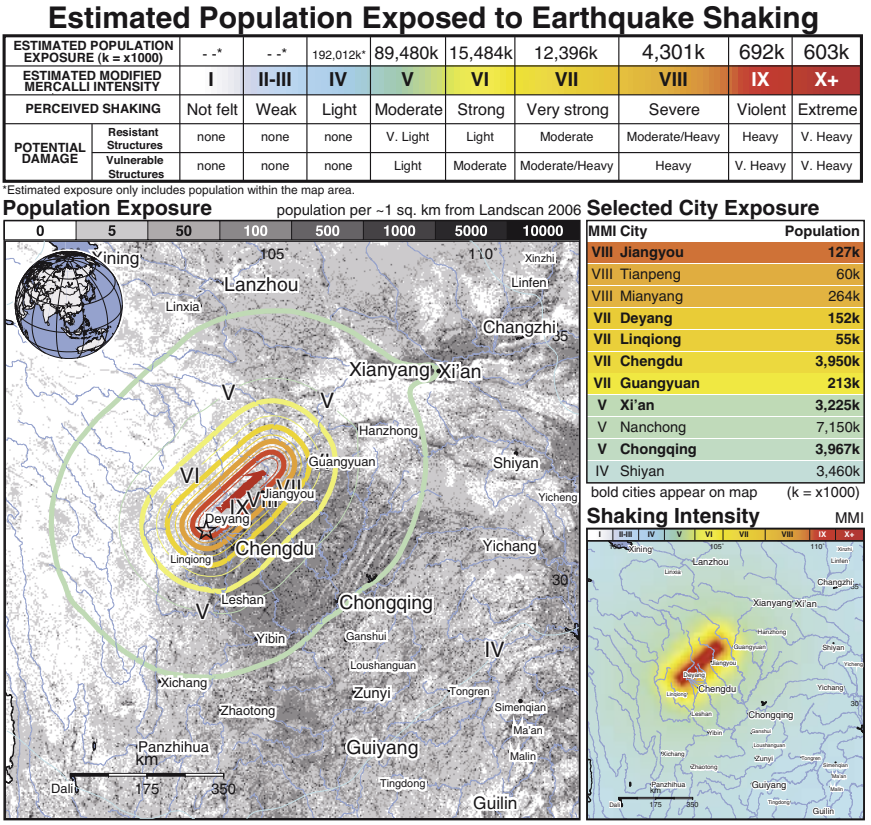
THE 2008 WENCHUAN EARTHQUAKE

Earthquake Damage

On May 12, 2008, a magnitude 7.9 earthquake struck Sichuan Province in China, affecting more than 100,000 square miles and 30 million people (EERI 2008). It caused 69,226 deaths, and another 17,923 people were officially reported missing; 1,486,405 people had to be relocated (State Council of the People's Republic of China 2008a).[2] Its effects were felt in 417 counties in 10 provinces. Some towns and many villages were completely destroyed, especially in Beichuan County and Wenchuan County.

Numerous landslides in the steep mountains buried communities and their inhabitants, damaged roads and infrastructure, and created temporary dams that threatened to flood downstream areas (EERI 2008). The earthquake disrupted water and power systems, damaged 187 highways and expressways, and interrupted services on seven major railway lines (Shi et al. 2013).

The earthquake also stopped production at 5,645 large industrial enterprises, destroyed 137,000 hectares of farmland and 486,000 hectares of forest land, damaged greenhouses and warehouses, and completely interrupted tourism (Shi et al. 2013). A survey by the Ministry of Civil Affairs calculated the total direct economic loss at 845,136 billion yuan (US$124 billion), of which 771,717 billion yuan (US$113 billion) was in Sichuan Province.[3]



More than 5 million people over a wide area were exposed to severe levels of shaking during the May 12, 2008, Wenchuan earthquake. *Source*: U.S. Geological Survey (2008).

Initial Governmental Response

The Wenchuan earthquake occurred less than three months before the 2008 Olympics in Beijing. China saw the Olympics as an opportunity to showcase modern China, and because the press throughout the world was already writing about China, a deficient response to the earthquake would severely undermine this carefully constructed image. Allocation of too many resources for earthquake relief, however, would divert them from the Olympics projects, which were feverishly being completed in the weeks leading up to the games.

The 2008 earthquake caused severe damage to numerous cities throughout a wide region of China, including most of the industrial town of Hanwang, Mianzhu City. Photo by Robert Olshansky (2011).

By all accounts, the central government's response was timely, comprehensive, and well organized. The government immediately mobilized 146,000 troops of the People's Liberation Army and 75,000 reserves and police, supplemented by personnel and equipment supplied by other provinces and major cities (Shi et al. 2013). Nongovernmental organizations (NGOs), volunteers, and local community groups contributed to the initial response, and the period immediately after the earthquake saw a remarkable emergence of civil society activities (EERI 2008).[4] China also accepted some foreign assistance, which was unusual. As of mid-July, the United Nations, for example, had already provided US$17 million worth of assistance, and 14 UN agencies planned to continue to work with Chinese agencies on reconstruction (*China Daily* 2008k).

Many observers have praised the Chinese government's emergency response, which was characterized by surprising speed, top priority at the

highest levels of government, and a remarkable degree of openness. "The message was clear: the commitment of the Central Authority towards the crisis was substantial" (Hui 2009, 138). The high level of transparency was remarkable in the weeks after the earthquake. The government frequently released quake-related information, consulted widely with stakeholders, and granted an unusually high level of access to the press, including the foreign press. This openness during the initial response, however, did not extend into the following recovery period (Hui 2009).[5]

In late August, nearly four months after the earthquake, approximately 92 percent of the 139,000 damaged businesses had reopened, and over 660,000 temporary housing units had been constructed (EERI 2008).[6] Workers from 25 provinces and municipalities built housing in concentrated clusters, along with stores and support services (Xinhua News Agency 2008c).

ORGANIZING FOR RECOVERY

China's 50-member State Council, chaired by Premier Wen Jiabao, established the Earthquake Rescue and Relief Headquarters on May 12, the day of the earthquake (Shi et al. 2013). On May 19, Sichuan Province created the parallel Post-Earthquake Reconstruction Planning Group, led by the Sichuan Development and Reform Commission, with more than 300 members (Feng 2008). By May 23, the headquarters established the Post-Earthquake Reconstruction Planning Group to create a recovery plan within three months.

On May 21, the State Council's Earthquake Rescue and Relief Headquarters established the National Committee of Experts for the Wenchuan Earthquake, made up of 30 experts from national agencies concerned with science, engineering, natural resources, land development, and housing (Ke 2008). The purpose of the committee was to provide scientific support for damage assessment and reconstruction. The chair, Qiu Baoxing, the vice minister of housing and urban development, stressed that immediate research was needed, both on the affected area and on experiences from the post-earthquake reconstruction of Tangshan (1976) and Lijiang (1996) (Ke 2008). He emphasized that post-disaster reconstruction needed to be

rationally and scientifically organized. The Committee of Experts was supported by 10 work teams that addressed the following issues: rescue and relief, people's livelihoods, seismic monitoring, health and prevention of epidemics, media relations, restoration of production, infrastructure assurance, post-disaster reconstruction, water conservation, and public security (Shi et al. 2013).

The National Development and Reform Commission (NDRC), the national economic planning agency under the State Council, led the reconstruction planning effort and worked with its counterpart agency in Sichuan Province to develop a work plan. The final work plan was approved by the Rescue and Relief Headquarters on June 3, passed by the State Council on June 4, announced to affected provinces and national agencies on June 6, and released as a formal document, *Regulation on Restoration and Reconstruction in Wenchuan Earthquake Hit Regions*, dated June 8 (Shi et al. 2013; State Council of the People's Republic of China 2008b).

Restoration and Reconstruction Plans

The *Regulation on Restoration and Reconstruction* laid out the process for planning and reconstruction. The NDRC would work with other State Council departments and the provincial governments "to prepare the post-quake restoration and reconstruction plan and submit to the State Council for approval before implementation" (State Council of the People's Republic of China 2008b, 9). In the next stage, the county and municipal governments, under the guidance of the province, would "organize preparation of the implementation plan for post-quake restoration and reconstruction within their respective jurisdiction" (9).

The *Regulation* outlined the planning principles as follows:

> The post-quake restoration and reconstruction plan shall follow the view of scientific development in all respects, value people, give priority to restoration and reconstruction of basic living facilities for affected people and public services facilities, respect science and nature, and give due consideration to the carrying capacity of resources and environment. Said plan shall make a balanced consideration by taking into account promoting industrialization, urbanization, new rural area construction, main function zone construction and updating of industrial structure. (9)

The *Regulation* also called for earthquake-resistant construction (especially for high-occupancy buildings), respect for cultural heritage through design, and consideration of the opinions of the people in the affected areas. It required local governments to "conduct surveys and democratic discussion before finalization and promulgation of the plan for allocation of reconstruction funds," as well as to "publicize the sources, quantity, distribution and use of reconstruction funds and supplies" (22). The Development and Reform Departments of the State Council were to be responsible for auditing major construction projects (23). In early July, the State Council published reconstruction guidelines that focused on safe reconstruction of housing and gave priority to public facilities (*China Daily* 2008b).

On August 11, three months after the earthquake, the NDRC, under the auspices of the State Planning Group of Post-Wenchuan Earthquake Restoration and Reconstruction, released *The State Overall Planning for Post-Wenchuan Earthquake Restoration and Reconstruction (Public Opinion Soliciting Draft),* which announced the goal of achieving recovery within three years (National Development and Reform Commission, State Council of China 2008). The NDRC and the Sichuan Province Ministry of Housing and Rural-Urban Development were listed as coleaders in producing this document. The group included a wide range of organizations, including Shaanxi and Gansu Provinces, fourteen national-government ministries, ten national-government commissions, nine national-government administrations, the People's Bank of China, the Chinese Academy of Sciences, and the Chinese Academy of Engineering. In addition, the State Wenchuan Expert Committee and the State Bureau of Surveying and Mapping supported the work. The process involved hundreds of experts and numerous research and evaluation reports and included workshops to learn from international best practices (Government of China 2008).

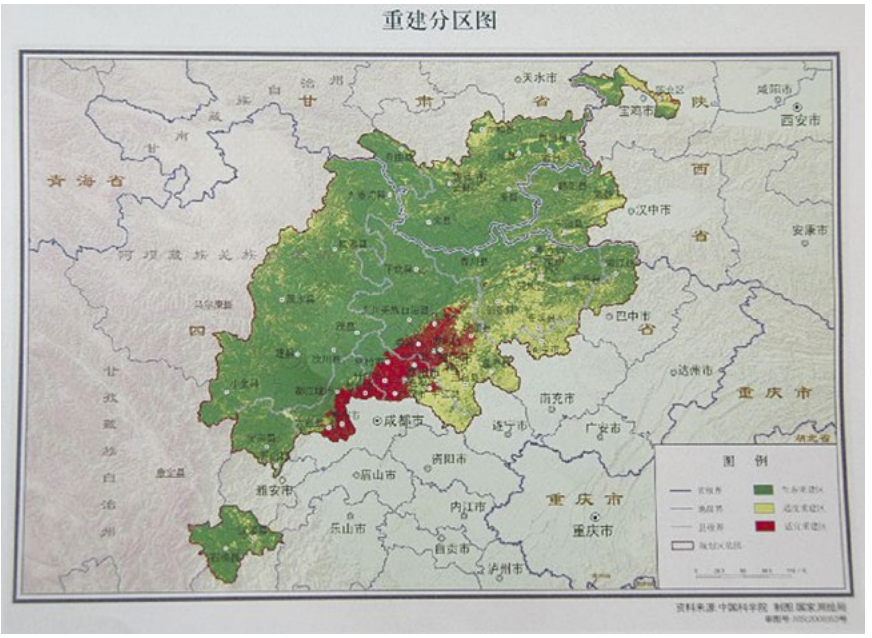
On September 19, the State Council released the final version of *The Overall Planning for Post-Wenchuan Earthquake Restoration and Reconstruction* (State Council of the People's Republic of China 2008a), which was virtually identical to the August draft except for a 20 to 30 percent reduction of the goals for the construction of urban and rural housing. The planning area consisted of 51 earthquake-affected counties in Sichuan, Gansu, and Shaanxi Provinces, involving 14,565 administrative villages in

1,271 towns and townships, with a 2007 population of 19.867 million (State Council of the People's Republic of China 2008a, 3). The overall goal was to "achieve the major task of restoration and reconstruction in approximately three years. The basic living conditions and the economic development level should reach or surpass the pre-disaster level." Objectives included employment for each household and improvements in the natural environment (14).

The plan noted that the earthquake had worsened existing environmental conditions and further weakened the capacity for agricultural and resource development in western China. It called for restoration and recovery, as well as "rationalized adjustment of the layout of urban and rural areas, infrastructures and productivity" (9). The mountainous areas, home to many ethnic minority groups, were "haunted by economic instability" and poverty (5). In addition, "A large number of tangible and intangible cultural heritage resource[s] . . . were destroyed, and it has become even more urgent to protect and carry forward the culture of the Qiang ethnic group" (8).

Based on the *Evaluation Report on Resources and Environment Carrying Capacity* by the Chinese Academy of Sciences, the plan divided reconstruction areas into three categories: suitable for reconstruction (7.6 percent of the planning area, with 7.73 million people),[7] suitable for appropriate reconstruction (28.9 percent of the planning area, with 11.80 million people),[8] and unsuitable for reconstruction (63.5 percent of the planning area, with 0.34 million people) (16).[9] It emphasized protection of agricultural land and allocated 57,393 hectares for development, including 23,190 hectares for urban and rural construction land, 11,000 hectares for rural residential land, and 16,367 hectares for infrastructure land. It emphasized tourism and "eco-agriculture," along with mineral resource development, and called for strict control over the size of industrial parks (20–21). Projections included constructing 2,188,700 rural housing units, strengthening 1,683,600 rural housing units, building 720,300 urban housing units, and strengthening 47.13 million m^2 of urban housing.

In cities and towns of historical and cultural significance, the goals were to "preserve as much [as possible] the original features . . . [with] strict construction control requirements" and to "preserve the traditional style



This hazard map from the *Evaluation Report on Resources and Environment Carrying Capacity*, produced by the State Council, shows three levels of development capability: green: ecological recovery district (not suitable for more development); yellow: moderate recovery district; red: suitable recovery district. *Source*: State Council of the People's Republic of China (2008).

of the appearance and use the most original construction materials or components for the buildings in true need of restoration." "The style of the damaged modern buildings to be restored and reconstructed within historical and cultural blocks shall be in harmony with the surrounding environment" (State Council of the People's Republic of China 2008a, 31). The plan outlined specific goals for restoration and improvement of agricultural production; rebuilding of rural infrastructure, schools, medical facilities, sports and cultural structures, employment and social welfare services, regional transportation and communication networks, energy production and distribution and water resource and flood-control systems, and commerce and trade centers; ecological restoration and reforestation; repair of damaged farmland; psychological rehabilitation; and earthquake memorials.

The section headed "Industrial Policy" stated that "tourism should be put as the pioneer industry in the restoration and reconstruction. The restoration and reconstruction funds, industrial investment funds, etc. shall be given first place to the restoration and reconstruction of tourism infrastructures and enterprises so as to promote the comprehensive restoration of tourism development at an early date" (State Council of the People's Republic of China 2008a, 77–78). The plan called for "investigation and monitoring of geological disasters" and improving the emergency response system (62), but said very little about disaster risk reduction.[10]

It was expected that some towns would be relocated, some reduced in size with concentrated layouts, and some expanded; these reconstruction modes would be determined by the provinces for towns, and by cities and counties for villages (State Council of the People's Republic of China 2008a, 20). In July, one high-ranking official suggested moving households to urban areas with existing employment opportunities elsewhere in China; this would simply be an extension of the ongoing process in China of migration of workers from rural to urban areas (*China Daily* 2008m).

The total capital needed for restoration and reconstruction was estimated at approximately one trillion yuan (about US$163 billion) (State Council of the People's Republic of China 2008a, 86). Much of this would come from central-government finance. Funds would also be collected from "local government allocation, counterpart assistance, social donations, domestic bank loans, capital market financing, foreign emergency loans on favorable terms, urban and rural self-possessed and self-collected capital, self-possessed and self-collected capital of enterprises, innovation financing, etc." (86–87). The provincial governments would plan, supervise, and coordinate reconstruction, but cities and counties would "concretely undertake the major tasks of shouldering and fulfilling the restoration and reconstruction" (90–91). The provincial governments would prepare an annual plan and specify time sequences of reconstruction activities. State Council agencies would support the work as appropriate. The plan called for the provincial governments and the State Council to conduct "mid-term" assessments of the implementation (92–93).

On October 14, 2008, the State Council replaced the Earthquake Rescue and Relief Headquarters with the Group for Coordinating Restoration and

Reconstruction and designated the provincial governments as the leads for reconstruction (Dunford and Li 2011). During the two months after the September *Overall Planning* document, 10 subarea plans on the following topics were released: urban and rural housing recovery, urban system recovery, rural construction, infrastructure recovery, public service facilities, geographic location of production and industrial adjustment, market service system, hazard prevention and reduction, ecosystem repair, and land use (Xiao et al. 2015). These contained lists of recovery projects, their costs, and financing sources, all approved by the NDRC.

The Rapid Pace of Planning Activities

The reconstruction planning effort was intense. Government agencies, universities, and consultants mobilized labor. Relief and reconstruction took up a great deal of China's governmental capacity and involved marshaling numerous national and provincial agencies to perform studies and develop reconstruction policies, as well as frequent meetings of the State Council's earthquake relief headquarters. A July 7 news release stated that Sichuan Province had sent more than 800 experts to perform geologic and site-selection analyses to form the basis for the 10 sector plans to be completed by July 10 (People's Government of Sichuan Province 2008).

In a presentation in Chengdu on July 17 to American urban planning experts assembled by the Massachusetts Institute of Technology's China Planning Network, Qiao Zhang, from Chengdu's Planning Bureau, described the ambitious planning effort for Dujiangyan and adjacent areas: housing for one million homeless people, relocation of 750,000 rural households, and increased urbanization of Dujiangyan (Q. Zhang 2008). According to Zhang, this effort involved 600 Chengdu staff members plus 400 consultants from universities around the country. At least 10 consulting firms from China and elsewhere were selected as early as June 10 to assist in the planning of Dujiangyan (Sokol 2008). The intent was to finish the plan by the end of July.

On June 12, the government of China and the World Bank jointly organized a workshop in Beijing, "Earthquake Recovery and Reconstruction: International Experience and Best Practices" (World Bank 2008).

Speakers from India, Turkey, and the United States gave presentations on assessing damage and loss and designing a reconstruction and recovery program. According to the account of the meeting in the *China Daily*, attendees advised the Chinese government to fully engage communities in both planning and implementation because "smooth and thorough communication between policymakers and the local disaster-affected public will have a long-term effect on the rebuilding process" (*China Daily* 2008f). World Bank representatives encouraged a "people-centered approach" and suggested both a "partnership model" for managing reconstruction funds and broad participation of a variety of local partners for implementing reconstruction (*China Daily* 2008f). For example, the *China Daily* quoted Rajesh Kishore, chief executive officer of India's Gujarat State Disaster Management Authority, as warning, "The important thing of reconstruction is to do it right, rather than quickly, despite the pressure to build homes for the people living in the tents. Or, you may lay a weak foundation to something else tomorrow" (*China Daily* 2008c).

The Ministry of Commerce and the United Nations jointly organized the "International Workshop on Post-Earthquake Reconstruction Experiences" on July 14–15 in Beijing, with presentations to Chinese government officials by nine UN agencies, India, Indonesia, Japan, Pakistan, the Philippines, and Sri Lanka (United Nations in China and Ministry of Commerce of the People's Republic of China 2008). The workshop presenters emphasized capacity building, community participation, coordination, disaster risk reduction, environmental protection, and two-way communication as keys to success. In early July, the China Office of the Japan International Cooperation Agency held a seminar in Beijing on Japan's post-earthquake reconstruction experiences (Jing 2008). Wang Guangsi, vice director of the Sichuan Development and Reform Commission, observed that, given the time constraints, the commission needed to create both the general plan and specific plans at the same time, condensing about 150 million words of original materials—including earthquake and reconstruction experiences from other parts of the world—into a coherent plan (Feng 2008).

Financing

Financing for priority reconstruction projects began even before recovery plans were complete. In early June, the Chinese government announced that it allocated 30 billion yuan (US$4.3 billion)—later increased to 40 billion yuan—for subsidies for farmers with damaged homes. The Ministries of Finance and Civil Affairs provided up to 10,000 yuan (US$1,400) for each affected household (*China Daily* 2008j, 2008n). The government also asked for "citizens, corporations and other organizations to actively participate in post-quake restoration and reconstruction" and agreed to accept international assistance (State Council of the People's Republic of China 2008b, 3). By the middle of June, domestic and foreign donations had reached 45.73 billion yuan (US$6.6 billion); the government needed to develop procedures for the equitable and efficient use of those funds. The State Council announced that home rebuilding would be the top priority of donated funds (*China Daily* 2008h). Eventually, donations reached 75.197 billion yuan (US$11.0 billion) (Shi et al. 2013).

By late June, the Chinese government had begun reallocating funds from relief to reconstruction. According to the minister of finance, the government intended to allocate 70 billion yuan (US$10.14 billion) of the 2008 budget to the reconstruction fund; 60 billion would come from the "stability and regulation fund," 5 billion from vehicle taxes, 4 billion from operations of state-owned assets, and 1 billion from the welfare lottery fund (*China Daily* 2008n).

By early July, various financial agencies, such as the Industrial and Commercial Bank of China, had issued 52.95 billion yuan (US$7.5 billion) in reconstruction loans (*China Daily* 2008d). For example, the Sichuan branch of the State Development Bank provided loans of nearly 1.2 billion yuan (US$ 170 million) to the Dujiangyan municipal government to reconstruct cultural heritage sites, high schools, and houses and pledged loans of over 7 billion yuan (US$1 billion) for urban infrastructure (Lianying 2008). The World Bank provided an emergency loan of US$710 million for the Wenchuan Earthquake Recovery Project, which financed several projects for construction of infrastructure and public facilities (World Bank 2012).

According to *The Overall Planning for Post-Wenchuan Earthquake Restoration and Reconstruction* (State Council of the People's Republic of China 2008a), the reconstruction was expected to cost 1 trillion yuan (US$147 billion), approximately the entire GDP of Sichuan Province in 2007 and about 20 percent of all Chinese government income in 2007 (*China Daily* 2008g). In November 2008, in response to the international economic crisis, the State Council initiated a stimulus package that included a plan to spend the 1 trillion yuan for earthquake reconstruction more quickly (Naughton 2009).

Within a few months after the earthquake, the central government recognized that obtaining large amounts of financing from multiple sources, auditing the flows of money, and monitoring construction quality would be major challenges (*China Daily* 2008g). In the end, the major sources of financing were loans from financial institutions (some of them backed by the government), transfers from the central government, help from eastern provinces under the "pair assistance" program (described later in this chapter), and provincial- and local-government savings (Xiao et al. 2015). Other important sources included private donations and land-based financing, which included transfers of development rights and land swaps.

NOTABLE RECOVERY FEATURES

The Overall Approach to Recovery Management

The government used a variety of communication, legal, and policy tools to shape the recovery process.[11] Widespread news coverage framed the disaster as a national crisis that promoted altruistic behavior and national pride. It was clear to the entire nation that the recovery process was the top priority. Because there was no clear legal guidance for post-disaster recovery, the State Council needed to issue regulations to set the legal foundation. The June 8 *Regulations* mandated an overall recovery plan by the NDRC, to be implemented by multiple levels of government (State Council of the People's Republic of China 2008b).

The process was facilitated by the Communist Party's evaluation and promotion system for government officials. Officials were motivated to fol-

low the policies and political orders issued from the top. The priority given to pair assistance, for example, ensured its enthusiastic implementation by donor provinces and receiving counties alike. Government officials could easily implement recovery policies because they were consistent with pre-disaster development policies, such as promoting urbanization, consolidating rural services, and promoting cleaner industries. Officials were familiar with the policies and the implementation tools and saw the post-earthquake recovery as a way to help achieve their goals more quickly, which would enhance their promotion prospects.

Acceleration of Existing Policies

The post-earthquake recovery provided the central government with an opportunity to accelerate several ongoing development policies in the western regions and in the nation. These included policies for modernizing the economies of the western provinces, improving rural incomes, concentrating rural residents in new villages to create urban environments in the countryside, and integrating the governance and economies of rural and urban portions of metropolitan areas (Abramson and Qi 2011). Chengdu, in particular, was a leader in urban-rural integration because it had been nationally designated in 2007 as one of two experimental zones that sought to improve the lives of rural residents by introducing urban characteristics while also improving land use efficiency by consolidating rural residential areas (Abramson and Qi 2011; Peng et al. 2013).[12] Ultimately, this process is expected to eliminate the current rigid distinctions in China between urban and rural residents (Abramson and Qi 2011). Through this designation, Chengdu was given freedom to innovate methods of governance, infrastructure and service provision, and economic development, including methods for transforming land into capital for housing (Xiao et al. 2015). This process was accelerated after the earthquake.

The recovery was generally viewed as an opportunity to improve regional infrastructure and expand urbanization of existing cities, such as Dujiangyan. By early July 2008, Sichuan Province announced that it would build two new highways to further increase growth in its main urban corridor as part of an overall plan to relocate people from the mountains to the

lowlands (Jing 2008). Chengdu, which includes earthquake-damaged Dujiangyan, was developing a plan to boost regional economic development by finishing reconstruction in three years and then bringing "development to a higher level within five years" (*China Daily* 2008i).[13] The recovery was seen as an opportunity to promote economic development in the region, but, in general, economic development policies revolved around a few simple concepts: closing down industries in the mountains and promoting tourism in those areas while promoting development of industrial parks to provide jobs in newly urbanizing areas.

Counterpart (Pair) Assistance

On May 20, the State Council assigned 23 eastern provinces the task of providing temporary housing. The August draft plan first described the counterpart assistance policy for long-term recovery in detail: "According to their annual material workload, 19 assistance provinces (cities) shall offer assistance with no less than 1% of their last ordinary budget revenues to their 24 counterpart counties (cities, districts) in Sichuan, Gansu and Shaanxi Provinces" (National Development and Reform Commission, State Council of China 2008, 116). Counterpart assistance funds were to be applied to housing, public services, and infrastructure, "as well as services such as planning formulation, architectural design, expert consultation, engineering construction and supervision, etc." (National Development and Reform Commission, State Council of China 2008, 126).

The pair assistance policy originated in Chinese policies in the 1970s and 1980s that designated eastern provinces to assist western provinces in need of economic development in order to more evenly distribute economic activity throughout the country (Yong and Booth 2011). For post-disaster assistance, however, this was a new tool. The assignment of one province to each damaged county specified the geographic boundaries of assistance and simplified the government's task of monitoring and evaluation. The policy not only provided funds but also added capacity and services. Assistance included direct physical reconstruction, personnel exchanges to improve capacity, and economic development through construction of industrial parks. It brought innovation and new ideas to the

affected area, promoted cultural exchange, and created a sense of positive competition among donor provinces, which helped make it a success.

The pair assistance system was also an important political tool, implemented by the Chinese Communist Party (CCP) (Xiao et al. 2015). In June, the CCP Central Committee and the State Council emphasized the need for pair assistance for successful recovery. As a result, in most provinces and cities, the CCP chairman or governor led the team. This structure is usually used only for the highest-priority matters.

By the end of 2009, donor provinces had initiated 3,105 counterpart assistance projects, and 50 percent of them had already been completed (Yong and Booth 2011). There were also indications that the cooperation would continue over time. According to the *Beijing Review*, "More than 100,000 people from 19 donor provinces and municipalities in prosperous central and eastern regions" were involved (Wei 2010). For example, Guangdong Province gave 8.2 billion yuan (US$1.2 billion) to Wenchuan

Banners and signs expressed gratitude to donor provinces for pair assistance. The right column of this gateway, near a temporary housing site in Wenchuan county in 2008, says, "Guangzho-Wenchuan heart to heart." Photo by Laurie Johnson (2008).

County, and Shandong gave over 10 billion yuan (US$1.5 billion) to Beichuan County. Total aid from the donor provinces was over 70 billion yuan (US$10 billion) (Wei 2010).

Housing Reconstruction Policies

The Ministry of Housing led a process of owner-driven reconstruction (Dunford and Li 2011). It provided grants for reconstruction based on household size and relocation grants for households that moved. Because the grants were insufficient to cover construction costs, short-term interest-free loans were also available. The details of these policies varied, depending on whether houses were in rural or urban areas, reconstruction was in situ or in relocation areas, and relocation was for safety reasons or was part of rural land consolidation. In rural areas, households could choose between taking the government subsidy and rebuilding on their own or moving into concentrated areas of housing built by the government (Deng 2010).

For example, the municipality of Chengdu, which encompasses both rural and urban areas, such as the cities of Chengdu and Dujiangyan, offered several housing choices for survivors, including self-built housing, owner-led cooperative housing, and government-built housing on either original or new sites (*China Daily* 2008i). The government also offered to help rural households with the collective purchase of construction materials and with additional loans (*China Daily* 2008i). Planned reconstruction by the government was designed to make more efficient use of rural land; this model was also applied on a trial basis in urban parts of Dujiangyan. Dujiangyan offered a cash or house choice similar to that being offered to rural residents.

Collective Relocations

Officials considered relocation for several towns, either because debris was excessive or because they were in unstable mountainous locations with insecure access routes. Planners in the city of Dujiangyan, for example, wanted residents to relocate from the overcrowded and heavily damaged

city center, but when they surveyed residents, they found that 93 percent did not want to relocate (Dai 2012).

Rebuilding towns and roads within the steep, unstable mountains of Wenchuan County posed a dilemma for officials. As of July 2008, they were still unsure whether to rebuild there (*China Daily* 2008l). Very little safe land was available for reconstruction, and even temporary accommodations were a concern. Besides the risk of additional earthquakes, secondary hazards of landslides and flooding had increased throughout the county after the May earthquake (*China Daily* 2008e).

Of particular concern was Weizhou, the county seat of Wenchuan County, which had grown considerably in a geologically unstable area since the 1950s. Some planners proposed total relocation of the population, including sending students to Guangdong Province for vocational training (*China Daily* 2008e). Beichuan, the county seat of nearby Beichuan County, was similarly situated. Both towns were commercial centers for surrounding mountain areas. But they were not traditional locations; both of them had been created in 1952 to improve accessibility of these mountain regions to the transportation system, and both had grown over the following decades to better serve the governmental and commercial needs of these remote ethnic areas (Li 2012). In both cases, the town sites, in narrow canyon bottoms, proved to be problematic for urban development.

Officials in Weizhou decided to rebuild.[14] Under the pair assistance system, Guangdong Province prepared the master plan for Weizhou and paid for the construction. Wenchuan County hired the Tsinghua Urban Planning and Design Institute to prepare the site plan (Zheng 2011). Like most towns in this area, Weizhou was located on land adjacent to a river and at the base of steep slopes. One goal of the new plan was to reduce the density of the old city and to replace older buildings with new, safer ones. In addition, new roads, parks along the river, and flood-escape areas on higher ground improved overall safety. Because of the focus on speed and efficiency, however, not all design problems were resolved, despite consultations with a variety of stakeholders (Zheng 2011).

One of the most dramatic recovery stories after the 2008 earthquake was that of Beichuan City, the county seat of Beichuan County, an autonomous

After the 2008 earthquake, Weizhou, the county seat of Wenchuan County, was reconstructed in its original location in the mountains. Photo by Laurie Johnson (2011).

county of the Qiang ethnic group. The county seat was located in a narrow valley of the Qian River and was surrounded by steep mountains (China Academy of Urban Planning and Design 2011). The earthquake devastated the town; 80 percent of the buildings collapsed, and approximately 6,000 people lost their lives. Subsequent landslides and flooding caused further damage. As a result, discussions regarding reconstructing the town in a new location began shortly after the disaster. One week after the earthquake, on May 19, a planning task force arrived, organized by the Ministry of Housing and Urban-Rural Development and led by Li Xiaojiang, the president of the China Academy of Urban Planning and Design (CAUPD). According to the account by the CAUPD, the local leaders of Beichuan County asked for a new town (China Academy of Urban Planning and Design 2011), and it took several months to persuade the central government to approve this (Li 2012).[15] By the end of May, the CAUPD and the Wuhan Institute of Geological Engineering Exploration completed the *Preliminary Report on Beichuan*

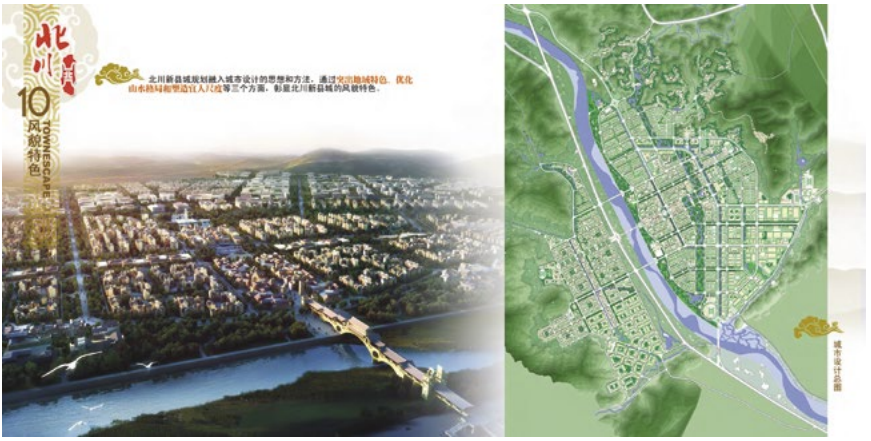
Reconstruction Site Selection Demonstration (China Academy of Urban Planning and Design 2011). This report studied the feasibility of relocation and proposed alternative sites based on geologic, regional development, and administrative considerations. Beichuan County officials then made their request to the State Council Earthquake Relief Headquarters, and by June 3, Qiu Baoxing, the vice minister of housing and urban-rural development, inspected both the damaged town and the proposed new site.[16] A major landslide that struck the old part of the town in September 2008 further underscored the rationale for relocation (Zhu, Li, and Huang 2012). Because there was still a lack of consensus among government officials, in October 2008, the CAUPD surveyed displaced residents in the temporary housing site. In meetings over two nights, 1,000 people participated, and 95 percent of them said that they wanted to move to a new site (Huang 2012).

The city of Beichuan, shown in 2009, was seriously damaged and abandoned as a result of the 2008 earthquake. Photo by Robert Olshansky (2009).

The new town site occupies about 10 km^2 of a broad, level valley about 23 km from the original site (Chen 2011).[17] Because of the difficulty in finding a suitable safe site within mountainous Beichuan County, the new site was in neighboring Anxian County, which transferred the land to Beichuan County. This new location was also seen as a way to integrate the economy of Beichuan County with the valley economies of Mianyang and the rest of Sichuan Province. The new town is now only 25 km from downtown Mianyang and has much better access to the regional transportation system than in the previous location. It was projected to have a population of 35,000 in the near term and 70,000 in the long term. Reportedly, the new town housed 40,000 people as of 2013 (Lim 2013).[18]

The planning and reconstruction processes were rapid (China Academy of Urban Planning and Design 2011). The State Council approved the site in November 2008, and the land was transferred three months later. The Beichuan County Post-quake Reconstruction Planning Committee was established in March 2009, and the planning, design, and review processes proceeded through early 2010. The Qiang Feature Pedestrian Street opened in April 2010, and in December 2010, the first group of residents, selected by a lottery, moved into the new town. The new Beichuan consists of an "integrative living area," a "recreational tourist vacation area," and the 121-hectare Shandong Industrial Park, intended to provide up to 10,000 jobs (China Academy of Urban Planning and Design 2011, 20). In the residential area, 9,000 affordable housing units were to be constructed by 2010 and an additional 2,600 units by 2015, all intended for disaster-affected households, former residents of Qushan, and other "land-deprived peasants" (China Academy of Urban Planning and Design 2011, 20).

In two years, 50,000 construction workers in Beichuan built 715 buildings in 218 reconstruction projects with a total of 1.8 million square meters of floor space, 65 km of roads, and 54 km of utility lines and planted 78,000 trees at a cost of 11 billion yuan (about US$1.6 billion) (Zhu, Li, and Huang 2012). Shandong Province provided the funds under the pair assistance system. Building a town so quickly required several layers of coordination, involving local municipal and county governments along with the Shandong Province Partner Commanding Headquarters, which represented the provincial government of Shandong Province and co-



This image depicts the townscape plan for the new town of Beichuan. *Source*: China Academy of Urban Planning and Design, Ministry of Construction (2011).

ordinated the construction projects sponsored by its 17 municipalities (Zhu, Li, and Huang 2012). In addition, through a public bidding process, the local government selected Huaxi Corporation for the construction projects under its supervision. The municipal and county governments established the Beichuan Post-earthquake Reconstruction Committee, whose members consisted of officers from municipal and county agencies and Shandong Province and planners from the China Academy of Urban Planning and Design (Zhu, Li, and Huang 2012). Under the coordination of the CAUPD, Beichuan County invited experts in planning, architecture, and infrastructure to participate; over 1,000 experts were involved in the design and review process, which involved more than 300 meetings (Zhu, Li, and Huang 2012). Implementation also required considerable negotiations with current residents of the new town site (Huang 2012).

RECONSTRUCTION OUTCOMES

Reconstruction Progress, 2008–2011

Although the broader reconstruction plans did not begin until the summer of 2008, repairs of infrastructure and large industries began immediately.

The new city of Beichuan, completed in 2010 and shown in 2011, was built to house 70,000 people. Photo by Laurie Johnson (2011).

By July 8, 2008, for example, 83 percent of the province's large industrial enterprises and 90 percent of local commercial businesses had resumed operations after the disruption of the earthquake (Yong and Booth 2011).

Permanent reconstruction was rapid. According to various accounts, on the first anniversary of the earthquake, the central government asked the nation to "intensify and accelerate progress" by one year so that "people in the disaster area can live a happier life as soon as possible" (Zhu, Li, and Huang 2012, 3; see also Dunford and Li 2011). Abramson and Qi refer to a mandate to "complete in two years the three-year plan" (2011, 497). According to the State Council, by September 2009, construction had begun on 30,269 of the 43,180 planned projects, and 17,849 projects had been completed (Dunford and Li 2011). By the fall of 2009, nearly 70 percent of destroyed schools had been rebuilt (Wei 2010), and 87 percent were completed by May 2010 (Yong and Booth 2011). By February 2010, 21 months after the earthquake, many people had already moved into their new

homes (Y. Hu 2010). Sichuan Province announced that it would finish construction of rural homes by February 14, urban homes by the second anniversary in May, and 90 percent of its projects by the end of 2010 (Y. Hu 2010). By May 2010, housing reconstruction was complete (Yong and Booth 2011). This included 1.91 million units of new rural housing and 0.29 million units of new urban housing, plus 2.92 million units of repaired rural housing and 1.46 million units of repaired urban housing (Wen 2011).

The speed of construction, however, brought concerns about corruption. The National Audit Office conducted a five-month audit of 72 major projects in 22 counties, using more than 4,500 staff (Y. Hu 2010). It concluded that 230 million yuan (US$34 million) had been misused, and time pressures had made it difficult to solve the problems. Reportedly, the National Audit Office in 2012 found that US$228 million had been illegally transferred, and 11 people were sentenced for corruption in post-earthquake rebuilding work (Lim 2013). A survey of 4,000 households conducted by the Chinese Academy of Science and Technology for Development found that 99 percent were satisfied with the efforts of the central and provincial governments, but that their trust in township governments had declined, reflecting the 350 officials who had violated laws during earthquake relief or reconstruction in 2009 (Y. Hu 2010). Trust by donors had also declined; after the 2013 earthquake in Sichuan Province, there was considerable opposition in Hong Kong to donating funds because of reports that 2008 funds had been wasted on useless projects (Tsang and But 2013).

Speed and Quality of Recovery

The speed of the recovery and the organization required to accomplish it were remarkable. The response and recovery were based on a strict hierarchical system that is a remnant of the previously planned economy in China. The top-down system is designed to set clear goals, with no debate, and to be implemented by bureaucrats whose future promotions depend on their achievement of the goals. Visible commitment by the highest levels of government and firm anticorruption policies set the tone for national mobilization to respond to the earthquake. But did reconstruction address

the stated planning goals of improving overall living conditions, balancing urban development with agricultural and environmental protection, protecting cultural heritage, providing hazard mitigation, and promoting citizen involvement?

The Chinese government described the rapid reconstruction of housing and infrastructure as an unqualified success that could be accomplished only within the institutional structure of a centralized socialist state. The following claims are typical:

> The firm leadership and scientific decisions of the CPC Central Committee and the State Council were the fundamental political guarantees for the victory. The persistence in putting people first and the scientific outlook on development were the solid ideology base for the victory. The persistence in unified coordination and command as well as close operation were the important organizational guarantees for the victory. . . . The people from all walks of life united as one, which was the strong cohesive force for the victory. The timely, accurate, open and transparent information dissemination and media coverage created good public opinion environment for the victory. (Shi et al. 2013, 80–81)
>
> In today's Wenchuan, local residents are reclaiming life amid a construction boom. Wenchuan's rapid revival is a vivid manifestation of China's ability to pool national strength to cope with major challenges. It also presents an excellent example of a post-disaster reconstruction model with Chinese characteristics. (Wei 2010)

By most accounts, despite the broad-based planning policies, reconstruction emphasized speed of housing reconstruction above all, and there was much less attention to livelihoods, public involvement, or systematic regional economic development, despite the realization by many Chinese leaders of the dangers of going too fast. For example, in July 2008, the vice minister of housing and urban and rural development, Qiu Baoxing, warned about many pitfalls to avoid, including excessive use of rural consolidation and overlooking local opinions and knowledge, and agreed that "disaster relief should be quick, but reconstruction should be slow" (Abramson and Qi 2011, 514). In the end, "all of the problems that Qiu Baoxing identified in the early months following the earthquake ultimately came to characterize the reconstruction process, to a greater or lesser extent" (Abramson and Qi 2011, 517).

In part, speed may have been emphasized because rapid urbanization was most consistent with preexisting reward structures for local government officials (Abramson and Qi 2011). In general, recovery actions emphasized physical development because this was the most visible indicator of recovery success. In addition to housing, many other new facilities were built. For example, new healthcare facilities increased floor area by 60 percent and hospital beds by 40 percent (Yong and Booth 2011). Wenchuan County benefited from improvements in capacity and quality of a range of public facilities: water supply, transportation, social welfare, leisure and sports, public markets, and disaster shelters. In addition, a new law required that high-occupancy buildings, such as schools and hospitals, meet higher seismic standards than other buildings. In a survey by the authors of 321 households in rural and urban areas of Wenchuan County, Beichuan County, and Dujiangyan City, most respondents reported improved transportation and infrastructure, as well as perceptions of improved structural safety. In many cases, however, construction quality was compromised in favor of speed, although it is difficult to confirm how widespread the problem was (Lim 2013).

Dunford and Li (2011) observed that the quality of reconstructed housing in 2009 varied. Although the quality of most housing, designed for earthquake resistance, had improved, many people still lived in poor-quality housing because the aid was insufficient to meet their needs. Despite additional reconstruction assistance in poorer areas, many lower-income households lacked resources to meet their reconstruction needs, and their situation was exacerbated by dramatic increases in prices of labor and materials, as much as threefold at the peak of construction activity (Dunford and Li 2011). Even many of those who successfully rebuilt had to use household savings and incur large amounts of debt, which could dampen long-term economic recovery (Dunford and Li 2011).

Rural Transformation

An important outcome of the recovery was the acceleration of the process of urban-rural integration, which clustered rural housing in villages with centralized services and provided more urban amenities for rural residents.

This process was most notable around Chengdu—already a leader in this process—and in relocation and modernization of remote ethnic Qiang populations.

A Chengdu planning official described how, within three years, the rural parts of Chengdu had been rebuilt with new homes in clusters that preserved the land and improved residents' access to services, and how village councils had given residents the opportunity to lead the reconstruction and resolve disputes (Wan 2011). By the middle of 2011, 169 schools and 82 health centers were completed and operating in Chengdu, and the disaster areas had been reconstructed to be more modern and to be better able to deliver public services than before the earthquake. In general, the area's development had been accelerated by 10 to 20 years.

According to a study by Peng and others of several villages in Dujiangyan, concentrated rural reconstruction was largely successful in this

After the 2008 earthquake, a new village center was built in the rural town of Xiang'e. Photo by Robert Olshansky (2011).

cultivated area of the Chengdu plain (Peng et al. 2013). The process was voluntary, residents participated in decision making, and concentration provided tangible economic benefits to participating residents in terms of housing, infrastructure, and access to services. In the four villages they studied—ranging from 220 to 817 households and damage rates of 48 percent to 95 percent—participation in concentrated reconstruction was 93 percent, 90 percent, 43 percent, and 32 percent. Still, these numbers show that participation rates varied and often fell far short of full participation.

Abramson and Qi (2011) are particularly critical of the application of this process to the ethnic Qiang settlements in mountainous areas of Sichuan Province. The Qiang were especially hard hit by the earthquake, which severely damaged their traditional housing and killed 10 percent of their population of 306,000. Abramson and Qi critique not only the excessive tourism theme that drove much of the post-earthquake redevelopment but also the oversimplified models of village development that ignored distinctions between populations, based on livelihoods, elevation, and road access. The process also ignored local knowledge of hazards, for example, by moving settlements into apparently more accessible but hazardous canyon bottoms. The speed of reconstruction disregarded many post-earthquake landslides and debris flows, which subsequently caused inundation problems in many of the new developments and "undid some high-profile projects just as they neared completion" (Abramson and Qi 2011, 518). Abramson and Qi observe that the emphasis on rapid urbanization caused planners to miss opportunities for innovation that could have come from stakeholder involvement. This occurred despite studies of other disasters that conclude that "broad civic participation in both planning and implementation produce more robust and locally appropriate recoveries. The post-Wenchuan earthquake recovery, however, by emphasizing physical development in accelerating urbanization, has not provided much scope to practice this lesson of international experience" (Abramson and Qi 2011, 497–498).

In the authors' interviews with earthquake-affected households, we found that many rural residents who lost their lands and are having difficulty recovering their livelihoods see accelerated urban-rural integration

as a land grab by local governments and development interests. A substantial proportion of rural households have lower income and employment opportunities than before the earthquake.

Economic Development

Because of the emphasis on visible construction, primarily housing, officials overseeing the recovery process did not pay sufficient attention to economic development and livelihoods, despite the importance that the plans attached to these topics. For example, Dunford and Li (2011) concluded that at the end of the first year, although the plans had emphasized poverty alleviation, most resources were directed only at housing reconstruction.

Many researchers have noted that the vision of tourism as an economic development strategy for the entire area is not likely to succeed. Every town plan in Wenchuan County emphasized the deindustrialization of these mountain areas and the creation of a new economy based on tourism (Dong 2012). Not only is it implausible that every town could rely on tourism, but also there is no analysis available to support such plans. During the authors' field visits to Beichuan from 2011 through 2013, we saw little evidence of successful tourism. A 2013 account on NPR noted that most of the tourism-related businesses in the Beichuan town center were losing money (Lim 2013).

Similarly, other economic development initiatives do not appear to have been based on market analyses. The recovery process was modeled on methods developed in the days of the planned socialist economy; for long-term recovery, however, its insensitivity to the market economy that now drives development in China has resulted in some new construction that is not marketable. The industrial park in the new city of Beichuan, for example, was still mostly vacant in 2013.

Public Involvement

The plans emphasized the importance of public involvement in reconstruction decision making, and many planning efforts involved numerous public meetings. Because of the speed of plan preparation, however, plans

generally did not reflect the concerns and knowledge of local residents (Ge, Gu, and Deng 2010). The authors' field investigations and interviews found that most public consultations, because of time constraints, consisted of presentation rather than creation of plans. In Wenchuan County, public involvement was mostly limited to collecting public opinions (Dong 2012). This was not true in all cases, however. Dujiangyan, for example, effectively involved many residents in specific cases of housing reconstruction (Chandrasekhar, Zhang, and Xiao 2014). The initial relocation decisions for Weizhou and Beichuan were based on citizen opinions.

PRECEDENT: RECOVERY FROM THE TANGSHAN EARTHQUAKE OF 1976

Although China is frequently affected by flooding, the last natural disaster comparable to the Wenchuan earthquake in costs and loss of life was the Tangshan earthquake of July 28, 1976, which almost totally destroyed Tangshan, a major industrial center with a population of 500,000. The official death toll of 242,000 made it one of the greatest disasters in modern times. The earthquake occurred during the Cultural Revolution and while Mao Zedong was on his deathbed—he died six weeks later, on September 9. The following brief account, summarized from Zhang, Zhang, et al. (2014), provides additional context for understanding the subsequent Wenchuan event. The leaders of China in 2008 were eager to show off the country's current capabilities as a contrast to the post-Tangshan recovery, which was seen as slow and poorly organized.

The immediate response to the Tangshan earthquake took several days despite the fact that Tangshan is only 150 km from Beijing. Within a few days, however, the central government established a headquarters for restoration. Thirteen days after the earthquake, it formed a recovery planning task force with over 60 planners from the Ministry of Urban and Rural Development, the Hebei Province Department of Construction, universities, and other provinces. The first draft of the *Tangshan Recovery Master Plan* was completed in November 1976, four months after the earthquake, but the State Council did not approve the plan until May 1977.

Recovery was to be financed internally using 1.55 billion yuan from the central government and 450 million yuan from the city of Tangshan;

the latter was equal to Tangshan's total revenues for the previous year.[19] China, closed to most foreigners at the time, refused all international assistance. The Ministry of Finance was in charge of the budgeting and approval of all recovery projects. Contributions also came from the People's Liberation Army, nearby municipalities, and other provinces. Hua Guofeng, Mao's successor as chairman of the Communist Party, in late 1977 asked that the reconstruction make Tangshan the safest city in the world, and he directed a group of over 100 planners and engineers to revise the plan in early 1978. The budget was increased from 2 billion to 3 billion yuan. The plan was revised again in September 1979.

Planners disagreed about reconstruction. Some favored complete relocation of Tangshan because debris removal would take too long. Others claimed that relocation would be too difficult, cost too much, and be socially disruptive. They said that safety could best be provided by strict seismic standards for buildings and setbacks from fault zones. The final plan included elements of both approaches: two districts were reconstructed in situ, and the third—the most heavily destroyed—was converted to open space and relocated to the northwest. The result would be three development clusters, 25 km from one another and connected by highways, with a population of 600,000 within five years. The plan emphasized neighborhood open spaces and open space between buildings—a change from traditional Chinese cities—in order to improve earthquake safety. It also separated residential areas from industrial areas and relocated industrial uses outside the city center. For seismic safety, reinforced concrete would be used, with maximum building heights of six stories.

Financing the reconstruction was difficult because the economy was weak after the Cultural Revolution. The central government prioritized rebuilding important state-owned industries in Tangshan, which further slowed housing reconstruction. During the first three years after the earthquake, only about 75 percent of the planned funding had been spent. In addition, planners had not considered the costs of the new building technologies, the difficulties of using new methods, or the rising costs of construction materials. In addition, temporary housing impeded construction of permanent housing. People also rebuilt in the Lunan district, which was planned to become open space; by 1980, 174,000 people were living there.

By 1981, the new national leadership decided to take a more pragmatic approach to the reconstruction. In early 1982, the State Council approved the *Tangshan Recovery Plan Amendments*, which emphasized quantity of housing units and speed of their construction. Officials deleted the collective relocation of the Lunan district from the plan, canceled infrastructure improvement projects, and lowered building standards. By October 1986, the last group of households moved to permanent housing. Most buildings were stronger than before, and residential areas had open space and better transportation access. The city has continued to change since 1986. Because of national economic growth, Tangshan now has a total population of approximately 2.4 million.

Chinese leaders in 2008 drew several lessons from the Tangshan experience in their planning for post-Wenchuan construction. Their primary concern was to avoid repeating Tangshan's slow and sometimes piecemeal

The mid-rise buildings are apartments in the thriving city of Tangshan constructed during the recovery period. High-rise buildings, like the four under construction, were built in more recent years. Photo by Robert Olshansky (2009).

housing recovery. One way to do this was to coordinate the siting of temporary and permanent housing. Another way was to create a planning and development framework that all levels of government would strictly follow. Most important, the 2008 reconstruction was an opportunity to demonstrate emphatically China's dramatic leap in financial, planning, and development capabilities in just 30 years.

LESSONS

Reconstruction after the Wenchuan earthquake was remarkably quick. Most of the housing, infrastructure, and public buildings were reconstructed within two to three years after the earthquake hit. This was possible because the central government made it a priority, and all officials at every level of government knew that their superiors would hold them accountable for their urgency and diligence in implementing the reconstruction plans. It was also possible because of the rapidly growing Chinese economy, much of which was based on rapid urbanization of the nation on a massive scale. By 2008, China had developed a very high level of capacity and experience in building cities quickly.

The pair assistance system facilitated the speed and efficiency of reconstruction. Although the central government devised this system, its advantage was that it decentralized recovery activities. It distributed some of the nation's financial burden to the wealthier provinces and facilitated the sharing of administrative and technical capacity. By creating many more channels of financial flows, it reduced the potential for bureaucratic bottlenecks to impede funding streams, such as those that have plagued reconstruction efforts in the United States and Japan. It also increased reconstruction capacity by mobilizing planners, designers, and construction specialists from the donor provinces and directly connecting them to earthquake-affected counties and towns.

Post-disaster reconstruction often affords the chance to implement broader development policies. In this case, the central government saw the opportunity for improvement in a region in need of modernization, infrastructure upgrades, and economic development. This was consistent with long-standing policies for the western provinces and more recent

initiatives on urban-rural consolidation. The goal was to promote economic prosperity and improve the lives of the inhabitants, consistent with modern methods of environmental protection, while also preserving the positive aspects of traditional cultures and traditions. Rather than introducing new approaches, however, officials in Sichuan Province expanded and accelerated preexisting programs for urbanization, urban-rural consolidation, and transformation of economies in the mountainous ethnic areas. "Thus, what initially was supposed to result in creative experiments in governance and project management, with greater participation by local residents, ended up having to satisfy the interests of an increasing number of external stakeholders" (Abramson and Qi 2011, 518).

Chinese officials portray the recovery from the Wenchuan earthquake as a complete success. It is convenient to focus on highly visible, physical manifestations of recovery and to present as evidence of their success the number of housing units constructed in such a short time. But serious analysis of every other post-disaster recovery concludes that speed of housing reconstruction is an incomplete measure of success. Simply counting the new housing units ignores the impacts on livelihoods, social networks, households, and communities. Some of these shortcomings have in fact occurred, although there is no easy way to measure their extent. But the overwhelmingly positive story promoted by the Chinese government must be tempered: there are costs to speedy reconstruction.

Many of these costs are rooted in a lack of stakeholder involvement. Every recovery case, including all those described in this book, shows that recovery decision making needs to be distributed among all the recovery actors to be fast and smart and to take advantage of local knowledge and local capacity. In contrast, the top-down system in China led to some problems: inappropriate housing design and location and economic strategies based on wishes rather than realistic assessments of local conditions. Although the pair assistance system had many advantages in speed, it also involved outside interests that lacked knowledge of and accountability to local residents and officials. It distributed recovery activities to a variety of actors nationally rather than locally, so communities and individuals had limited involvement in their recovery choices.

The comprehensive planning principles laid out in the first few months covered a broad range of issues and were based on consultation with thousands of professionals in ministries and universities and from recovery locations worldwide. But top-down planning presupposed a linear, rational process, driven by facts about the environment and the population, and gave little consideration to interaction effects, stakeholder processes, and indigenous knowledge. This rational model facilitated rapid reconstruction and provided new infrastructure for the region but inevitably created new problems, such as construction in risky locations and lack of attention to sustainable jobs.

NOTES

1. The study was conducted by the authors and Yu Xiao at Texas A&M University, Yang Zhang at Virginia Tech, and Yan Song at the University of North Carolina, with collaboration from Zhou Bo of Sichuan University and Braven Zhang at Beijing Normal University; see Chandrasekhar, Zhang, and Xiao 2014; Jiang 2014; Xiao et al. 2015; Zhang, Drake, et al. 2014; and Zhang, Zhang, et al. 2014.
2. Sources on this topic vary. According to Shi et al. (2013, 74), "Over 15,106,000 people had to be relocated emergently due to the disaster."
3. According to the plan released by the central government in August 2008, direct economic losses were 843.8 billion yuan (State Council of the Republic of China 2008a).
4. The blossoming of civil society networks continued during the three years of the recovery period (Lu 2012).
5. For example, the government was initially open regarding the large number of collapsed schools and promised to conduct a strict investigation; by June 2008, however, the government had backed off and prevented the press from further investigation of school building quality. By the one-year anniversary, it claimed that no people were at fault in the collapses (Jacobs 2009).
6. Sources vary. According to Ke (2008), by the time of the Olympics in July, workers had built 612,400 temporary housing units. According to the Xinhua News Agency in August, 4.5 million households had moved into prefabricated houses; two-thirds of them had built their own (Xinhua News Agency 2008c).
7. This category "mainly refers to the areas with relatively strong resources and environment carrying capacity and smaller disaster risks, suitable for the reconstruction of county seats, towns and townships on the original sites, for the aggregation of a relatively large population, and for the overall development of various industries. . . . The functions are oriented to promote industrialization and urbanization, to aggregate population and economy and to build into the

zones for revitalizing economy, carrying industries and creating employment" (State Council of the People's Republic of China 2008a, 16).

8. This category "mainly refers to the areas with relatively weak resources and environment carrying capacity and comparatively big disaster risks, suitable for appropriate reconstruction of county seats, towns and townships on the original sites under the precondition of controlled scale, for appropriate population aggregation, and for the development of specific industries. . . . The functions are oriented to give priority to protection, and carry out appropriate exploitation and spotty development, so as to build the zones with appropriate population, good eco-environment and distinctive industrial characteristics" (State Council of the People's Republic of China 2008a, 17).
9. This category "mainly refers to the areas with very low resources and environment carrying capacity, great disaster risks and significant ecological functions, where the construction land is in severe shortage and the cost of construction and maintenance of transportation and other infrastructures is extremely high, and where it is inappropriate to reconstruct towns in the original sites or to aggregate a large population. . . . The functions are oriented to focus on the ecological protection and restoration, and build the areas for protecting natural and cultural resources as well as rare and precious fauna and flora resources, with a small scattered population" (State Council of the People's Republic of China 2008a, 17–18).
10. The two policies most closely directed at disaster risk reduction were "Comprehensive disaster reduction. Establish 3 provincial earthquake disaster mitigation centers, 105 publicity and education bases for comprehensive disaster reduction and 129 refuges in rural and urban areas. . . . Geological hazard control. Control and treat 8,693 major hidden geological hazard spots, among which 4,694 were removed or let by" (State Council of the People's Republic of China, 2008b, 64).
11. The information in this section comes from interpretation of Chinese documents provided by Xiao et al. 2015.
12. This created additional farmland in rural areas and, in turn, allowed cities such as Chengdu to expand their urbanized areas without losing net farmland, protection of which had become an increasingly important national land policy since the mid-1980s (Hsing 2010). Thus, the process of consolidation of rural households served as a mechanism that allowed provinces to continue to urbanize while still maintaining their nationally required quotas of farmland. "When Chengdu became a pilot city for the revision of its municipal master plan and land-use master plan to incorporate urban-rural integration in 2003, the city sought to consolidate more than 970 square kilometres of rural collective built land area—the vast majority of which was individual scattered housing, small yards or natural villages—into 570 square kilometres of more centralized, planned housing estates and town centres, and thus gain 400 square kilometres of new land for agriculture or urban development" (Abramson and Qi 2011, 510).
13. Press reports refer to various governmental goals of three years for reconstruction, five years for improvement, and ten years for overall prosperity, but the only explicit goal in the plan is three years for reconstruction.

14. It would be useful to know the process and rationale for this decision, but attempts to learn more about this important aspect of the reconstruction have been unsuccessful. According to Dong (2012, 55), "The results show that most villagers hoped to stay at their original place and were not willing to remove to other places. For example, in the survey of Weizhou Recovery and Reconstruction Plan formulated by the Guangzhou Urban Planning and Survey Design Institute (2008), it shows that 47.8 percent of responses in Weizhou hope their houses be reconstructed completely at the same place, while as high as 85.2 percent want to move back to their original place if the area is confirmed safe and various preferential policies are able to be viably implemented."
15. According to a news report on May 23, 2008, however, Premier Wen Jiabao visited the disaster site and stated that the town would not be rebuilt, but would instead be turned into a memorial park (*China Daily* 2008a).
16. Accounts of the chronology of the site selection process are inconsistent. The published CAUPD history implies that the site was selected quite early in the process, but other sources describe a systematic process that would have required more time. For example, "The panel with the National Post-Disaster Reconstruction Planning conducted on-site evaluation in more than 20 townships and 300 villages across the county from June to August" (Chen 2011).
17. The new town is officially called Yongchang (Chen 2011; Lim 2013), but all other sources simply refer to it as Beichuan.
18. According to another account, when construction began, the first phase was expected to cost 19.32 billion yuan, and the town was expected to have 50,000 residents in three years and 85,000 residents by 2020 (*China View* 2009).
19. It is not possible to estimate a U.S. dollar equivalent for the yuan in 1976.

3 New Zealand

Centralizing Governance and Transforming Cityscapes

On April 15, 2011, with near-unanimous support, New Zealand's Parliament passed landmark legislation that granted unprecedented powers to a new national government department and national minister to guide recovery after the devastating earthquakes that occurred in the city of Christchurch and the Canterbury region in 2010 and 2011. This chapter focuses on the impetus for this centralized recovery management structure in New Zealand, as well as the major recovery plans, policies, and projects that resulted. In addition to a variety of secondary sources, this chapter is based on six years of study of New Zealand's recovery process after the 2010–2011 earthquakes.[1]

New Zealand is a constitutional monarchy, also referred to as the Crown. Its democratically elected Parliament appoints a prime minister who chairs the cabinet, and together they run the national government. Because New Zealand is a unitary state, the national government is supreme, and it delegates limited powers to its two subnational divisions—67 territorial authorities and 11 regional councils. Territorial authorities include cities and districts, which are responsible for all local-government functions, as well as unitary authorities, such as the Auckland Council, which perform the additional functions of a regional council. Territorial authorities are responsible for local land use management, network utility services (water,

wastewater, and solid-waste management), local roads, libraries, parks and reserves, and aspects of community development. Regional councils are primarily responsible for environmental management, regional transport and public transit, and regional land management.

Over 4.4 million people reside on the two main islands of New Zealand. In 2010, the country's gross domestic product (GDP) was nearly $190 billion New Zealand dollars (NZ$) (US$152 billion) (Statistics New Zealand 2010).[2] On the country's South Island, the Canterbury Regional Council, also known as Environment Canterbury, is the largest regional council (the population of the region was 565,800 in 2010) and the second-largest metropolitan area in the country behind Auckland. There are 10 territorial authorities in the Canterbury region, including the Christchurch City Council (CCC) (the population of Christchurch was 376,700 in 2010) and the district councils of Waimakariri (population 47,600 in 2010) and Selwyn (population 39,600 in 2010), as well as the tribal council of Te Rūnanga o Ngāi Tahu (population 50,000 in 2013, of which about 25,000 live on the South Island). The Canterbury region is also the major economic center of the South Island; its primary economic sectors are agriculture, education, and tourism.

NEW ZEALAND'S LAND USE AND DEVELOPMENT POLICY FRAMEWORK

New Zealand's land use and development management framework is largely governed by a suite of legislation adopted in the late 1980s and early 1990s during a period of comprehensive government reform that focused on decentralization, more deliberative planning and decision making, and sustainable management principles. The Local Government Act defines the authorities, responsibilities, and powers conferred on territorial authorities (New Zealand Parliament 2002b). It was intended, in part, to help ensure meaningful engagement of communities at the local-government level, particularly through long-term plans, which must describe the planned activities of the territorial authority over at least a 10-year period and be updated at least every 3 years. The act also requires a balanced budget that must be reflected in the long-term plan.

The Resource Management Act guides environmental management of natural and physical resources, including land use development and permitting (termed *consenting* in New Zealand) processes (New Zealand Parliament 1991, 2009). Territorial authorities must develop district plans that respect national environmental and land policy statements, the New Zealand Coastal Policy, and regional plans and policy statements. The powers of local and regional consenting authorities are defined in the act and include land use and subdivision consents and coastal, water, and discharge permits. The act also established a special court, the Environment Court, to deal with resource management and consenting disputes.

The Building Act controls the permitting and construction of housing and other buildings (New Zealand Parliament 2004, 2012). The national government establishes the country's building regulations and policies; territorial authorities are responsible for building consenting, construction, inspections, code enforcement, and other actions. Local and regional territorial authorities must also pay special attention to Maori traditional and treaty interests within regional and city settings.

NEW ZEALAND'S DISASTER RECOVERY POLICY FRAMEWORK

Before the 2010 and 2011 earthquakes, the magnitude 7.8 Hawkes Bay earthquake of 1931 was the most recent natural disaster that had significant national policy implications. It caused 258 deaths and major urban damage and required the complete reconstruction of the city of Napier. Soon after, New Zealand adopted seismic provisions as part of its building codes and became one of the first countries in the world to offer government-backed earthquake-damage insurance.

Today, the New Zealand Earthquake Commission (EQC) insures the country's residential properties against loss or damage caused by earthquakes, volcanic eruptions, hydrothermal activity, tsunamis, natural-disaster fires, and natural landslides (New Zealand Parliament 1993). An annual levy, which was about NZ$60 (US$48) in 2010, is added to all household fire insurance policies, and, in turn, the EQC provides up to NZ$100,000 (US$80,000) for structural damage and up to NZ$20,000 (US$16,000) for

content damage. It also pays the costs to stabilize damaged residential land.[3] Practically speaking, this means that nearly every household affected by the 2010 and 2011 earthquakes had some form of EQC coverage for damage to the structure, household contents, and land, underwritten by the national government and its Natural Disaster Fund, in which EQC premiums are accrued and available to pay claims when a disaster occurs. In 2010, the EQC was managing assets of NZ$5.93 billion (US$4.74 billion) in the Natural Disaster Fund (EQC 2013).

New Zealand has a sophisticated emergency management system that includes a framework for recovery management. The Civil Defence Emergency Management (CDEM) Act of 2002 defines a tiered emergency governance system in which the national government sets the direction and policies for emergency management, while local territorial authorities are responsible for implementation and coordination through regional groups (New Zealand Parliament 2002a). The Ministry of Civil Defence and Emergency Management (MCDEM) administers the system at the national level, and the Cabinet Committee for Domestic and External Security Coordination is the main body of the national government responsible for emergency management decision making. It is chaired by the prime minister and includes the ministers of departments that have emergency management roles.

Under the CDEM Act, CDEM groups are the lead agencies for local emergencies. These groups are consortia of local emergency service providers—regional councils and their respective local authorities, such as district and city councils. CDEM groups typically include mayors or their representatives and facilitate coordination among governments and other stakeholders in disaster management. Both CDEM groups and local territorial authorities are required to appoint recovery managers and develop plans for recovery from disasters. The CDEM recovery framework also calls for the establishment of task groups for the social, economic, natural, and built environments at each level of government during major emergencies to coordinate the efforts of agencies in each of these areas (MCDEM 2005). At the time of the September 2010 earthquake, the Canterbury CDEM Group was responsible for disaster and recovery management in the Canterbury region.

In 2010, New Zealand's national government was obligated to contribute up to 60 percent of the restoration costs for essential local infrastructure after a natural disaster; local authorities contributed 40 percent (New Zealand Office of the Auditor General 2012). Infrastructure includes local roads, water and wastewater systems, and levees and engineered embankments. Local authorities made annual contributions to the Local Authority Protection Programme fund to meet their 40 percent share.

THE CANTERBURY EARTHQUAKES OF 2010 AND 2011

At 4:35 a.m. on September 4, 2010, a magnitude 7.1 earthquake shook the Canterbury region. It became known as the Darfield earthquake because it struck near the small rural town of Darfield, located about 44 km (27 miles) west of the Christchurch central business district (CBD) (EERI 2010). The September earthquake surprisingly occurred close to Christchurch in the central plains of the Canterbury region, and not along the Alpine Fault—the tectonic plate boundary traversing New Zealand's South Island and located in the mountains about 100 km (70 miles) to the west. Given the generally strong building practices for residential buildings, there were very few injuries and no directly attributable fatalities. Still, the earthquake caused considerable damage to older commercial buildings and some residential areas. Areas in the Waimakariri District north of Christchurch and in Christchurch's CBD and eastern suburbs were harder hit. The Treasury estimated the economic impact at NZ$5 billion (US$4 billion) (Bollard and Rachhod 2011).

Earthquake-generated land movements damaged many residential properties, as well as neighborhood streets and portions of the water, wastewater, and storm-water systems. Some neighborhoods experienced dramatic ground failures, largely caused by lateral spreading and liquefaction of the highly saturated soils in the former river floodplains of eastern Canterbury. The extent of soil liquefaction was not surprising for an earthquake of this size, and planning agencies had previously mapped many of the affected areas as having moderate to high liquefaction potential.

Detailed maps and official designations of "Liquefaction Study Areas" in the Canterbury region have been available since about 2005,

Residential neighborhoods across the northern and eastern suburbs of Christchurch experienced multiple rounds of liquefaction, in which certain types of soil take on liquid-like properties when they are shaken, causing the ground to differentially settle and subside. Photo by Laurie Johnson (2011).

and thereafter, the information has been noted in the Land Information Memorandum (LIM)—an official government record available for every land parcel—and as part of the chapters on natural hazards of the Christchurch, Waimakariri, and Selwyn district plans (St. Clair and McMahon 2011). However, before this time, local governments had granted many planning and building consents for subdivisions and buildings without a clear understanding of this widespread hazard.

The earthquake on September 10 was followed by thousands of aftershocks. Magnitude 5.0 and 4.9 earthquakes on October 19 and December 26, 2010, caused further damage, closure of Christchurch's CBD, and power outages. Another strong aftershock, magnitude 5.1, occurred on January 20, 2011. But all these earthquakes faded in significance at 12:51 p.m. on Tuesday, February 22, 2011, when a magnitude 6.3 earthquake struck on a previously unmapped fault that was only 6 km (4 miles) from the Christchurch city center and just 5 km (3 miles) underground (EERI 2011).

The central business district of Christchurch was cordoned off for more than a year to help ensure public safety from aftershocks and facilitate the demolition of damaged buildings. Photo by Laurie Johnson (2012).

Although the magnitude of the February 22 earthquake was smaller than that of the Darfield earthquake, this earthquake caused far greater damage. One hundred eighty-five people died, most of them in the dramatic collapses of two buildings in the Christchurch CBD. Heritage buildings and other seismically retrofitted masonry buildings that performed well in the September earthquake collapsed this time. Four square kilometers (almost 1,000 acres) of the CBD were cordoned off, and more than 4,000 businesses and 55,000 central-city workers were displaced. Over 75 percent of the city's hotel accommodations and tourism facilities were disrupted or lost (CERA 2014a). Eventually, over half of the 2,000 commercial buildings in the CBD were demolished, and the CBD cordon area was progressively reduced as unsafe buildings were demolished; the cordon was completely removed on June 30, 2013 (Bennett et al. 2014).

Parks and riverbanks were riddled with slumps and other ground failures, while massive rockfalls scarred the hillsides. Neighborhood streets

and yards in Christchurch and the surrounding districts of Waimakariri and Selwyn were filled with sand; sewer and water pipes were severed; and a majority of the region's 160,000 homes suffered damage. An estimated 7,000 to 8,000 residents initially left the city (Howden-Chapman et al. 2014). Some waited for the aftershocks to subside and living conditions to improve, but others never returned.

The aftershocks continued, one of magnitude 6.0 on June 13, 2011, and another of magnitude 5.9 on December 23, 2011. Each caused additional liquefaction and building damage and raised serious concerns about the future viability of many residential neighborhoods that were experiencing repeated land and building damage. In all, more than a dozen earthquakes in the sequence resulted in residential building and land damage claims.

The cumulative effects of the Canterbury earthquakes were unprecedented in New Zealand. As of September 30, 2016, there were 430,843 valid claims to the EQC for building, contents, and land damage (EQC 2016). The total cost for responding to and rebuilding after the 2010–2011 earthquake sequence is estimated at NZ$40 billion (US$32 billion), or close to 20 percent of New Zealand's annual national GDP (Wood, Noy, and Parker 2016). This includes more than NZ$16 billion (US$12.8 billion) each for residential and commercial construction and around NZ$7 billion (US$5.6 billion) for infrastructure.

ORGANIZING FOR RECOVERY

All levels of government generally followed plans and procedures developed through the CDEM response framework for both earthquakes. After both the September 4 and February 22 earthquakes, each of the three most affected local territorial authorities—Christchurch City Council and the Waimakariri and Selwyn District Councils—declared local states of emergency; the September 4 declaration was the first in Christchurch's history.

Environment Canterbury also activated the Canterbury CDEM Group and its Emergency Coordination Centre after both earthquakes; however, it did not declare a region-wide state of emergency after the September 4 earthquake. This effectively meant that the local authorities were leading

the response without any formal regional coordination. This has been cited as one reason for the national government's increasing centralization of authority for recovery after the September 4 earthquake and even more after the February 22 earthquake (Johnson and Mamula-Seadon 2014).

The widespread and severe damage caused by the February 22 earthquake prompted the national minister of civil defense to declare a national emergency for the first time in New Zealand history, and disaster control was effectively transferred from the local councils and the Canterbury CDEM Group to the national controller (McLean et al. 2012). The national government activated its National Crisis Management Centre in Wellington in accordance with the national CDEM plan. However, the national director of the MCDEM, serving as the national controller, went to Christchurch and created the Christchurch Response Centre (CRC) by combining the Canterbury CDEM Group and Christchurch City Council emergency operations. At its peak, up to 500 staff operated out of the CRC.

At the national level, the police, urban search and rescue task forces, and the New Zealand Fire Service deployed personnel and helped assess the condition of buildings and ensure their stability and safety in both commercial and residential areas. Teams of geotechnical engineers and engineering geologists mobilized to assess land damage caused by the earthquake and inform the EQC of its potential claims. Similarly, both the EQC and private insurers conducted building damage claim assessments.

The National Government

On September 6, 2010, Prime Minister John Key announced the appointment of the Honorable Gerry Brownlee, minister for economic development and member of Parliament from Ilam, a suburb of Christchurch, to the new cabinet position of minister for Canterbury earthquake recovery. He was to be based in Christchurch and was to give daily media briefings and communicate with all relevant ministers and national-government leaders, as well as local agencies (Key 2010). Prime Minister Key also proclaimed that Minister Brownlee would head the newly appointed Ad Hoc Cabinet Committee on Canterbury Earthquake Recovery, which included

other cabinet ministers with earthquake-related responsibilities within their portfolios and was to meet regularly to ensure active ministerial coordination. The newly appointed minister argued that it was imperative to remove the bureaucracy of normal planning and consenting processes and speed up the recovery process to address the extensive damage to land, residential property, and infrastructure.

Members of Parliament raised concerns that the national government would have major financial commitments to recovery, but it might not have adequate statutory power to address the recovery needs of the region after local emergency powers expired. Thus, on September 14, 2010, just one day before the local states of emergency were set to expire, the Canterbury Earthquake Response and Recovery Bill was introduced into Parliament and passed with urgency and unanimously on the same day under an exemption from normal parliamentary examination procedures that precede the introduction of new legislation. The stated purposes of the new Canterbury Earthquake Response and Recovery Act 2010 included providing adequate statutory power to assist with earthquake response; enabling the relaxation or suspension of provisions in enactments; facilitating information gathering about any structure or infrastructure affected by the earthquake; and providing protection from liability for certain acts or omissions (New Zealand Parliament 2010a).

The act provided for orders in council—the main method by which the government implements decisions that need legal force—which effectively meant that national-government ministers were permitted to suspend or make exemptions from almost any New Zealand law. This transferred considerable law-making power from the legislative to the executive branch of the national government, and legal concerns arose about the removal of basic constitutional checks and balances on ministerial powers, which set a dangerous precedent (Geddis 2010). However, the overarching urgency to assist the affected region was seen as more important than concerns about the broadening powers of the national government (Dalziel 2011).

The act also established the Canterbury Earthquake Recovery Commission (CERC), composed of the mayors of the three affected local authorities and four government appointees, supported by a secretariat hosted by the Ministry of Economic Development. Its main purpose was to help

facilitate better coordination between impacted communities and the national government, serve as an information clearinghouse for government agencies, and deal with issues that could not be resolved locally (National Library of New Zealand 2011). It began functioning almost immediately after its authorization, was active through the February 22 earthquake, and was formally dissolved in April 2011. The CERC did not have executive powers and had yet to make an impact on recovery when the February 22 earthquake occurred (McLean et al. 2012).

On March 16, 2011, three weeks after the February 22 earthquake, the Ad Hoc Cabinet Committee on Canterbury Earthquake Recovery began considering new national governance arrangements to manage the Canterbury earthquake recovery effort. The first cabinet paper, released on March 28, 2011, cited aspects of the recovery experiences after the Napier, New Zealand earthquake (1931); Australia's Cyclone Tracy (1974), Victoria bushfires (2009), and Queensland floods (2011); and the United States' Hurricane Katrina (2005) (Brownlee and Ryall 2011). It recommended that a new, national public service department be created to provide leadership and coordination for the ongoing recovery effort and manage the fiscal situation. The investigation considered alternative models for the new organization and, given the "political and fiscal risk to the Crown" and the need for a "high degree of Ministerial control," recommended a national department (Brownlee and Ryall 2011, Annex 3, 18). The paper also recommended that normal parliamentary procedures and the normal timeline for establishing a new national department both be waived, given the emergency situation. The Canterbury Earthquake Recovery Authority (CERA) was provisionally established the next day, March 29, 2011.

Parliament agreed to an abbreviated legislative process to consider the recommendations made in the cabinet paper and, on April 14, 2011, passed the Canterbury Earthquake Recovery (CER) Act 2011 by a near-unanimous vote (Hartevelt 2011). Despite the easy approval of the CER Act, opponents still expressed concerns that it granted a wide range of unilateral powers to both the minister for CER and CERA, a newly created special-purpose, national department.

Some of these powers, as stated in the act, included allowing the minister for CER and, to a lesser extent, CERA and its chief executive to obtain

or require information from any person or source; acquire land compulsorily; suspend, amend, or revoke all or any part of the Resource Management Act, the Local Government Act, and other acts, as well as any plan or policies developed under various acts; and direct any local authority to take or cease any action (New Zealand Parliament 2011). The CER Act also specifically required that two plans be prepared: a draft overarching, long-term recovery strategy for greater Christchurch, to be prepared by the CERA chief executive, and a draft recovery plan for all or part of the Christchurch CBD, to be prepared by the Christchurch City Council. Both were to be developed within nine months of the act's passage.

The CER Act defined several mechanisms to provide oversight and input to the minister and guide recovery plans, policies, and programs. A four-member Canterbury Earthquake Recovery Review Panel was charged with reviewing draft orders in council developed by the minister for CER or CERA before they were recommended for national-government approval. A Cross-Party Parliamentary Forum and a local Community Forum were established to provide local and national input and coordination. Both forums faced organizational challenges and served mostly as informational communication vehicles (Murdoch 2012, 2014).

When the national state of emergency from the February 22, 2011, earthquake ended on April 30, responsibility for recovery in the Canterbury region formally passed from the national controller to CERA. The CER Act specified that CERA's mandate would end on April 18, 2016. The overall governance structure and roles of the minister for CER and CERA remained largely consistent with what was proposed in the March 28, 2011, cabinet papers and defined by the CER Act 2011 throughout the five-year period.

The Canterbury Earthquake Recovery Authority

Under the CER Act, CERA and its chief executive both reported directly to the minister for CER. The agency began with a small staff whose members were seconded from other government departments, local governments, and the private sector, and it was expected to eventually have about 55 staff (Murdoch 2012). However, as the recovery progressed, CERA be-

came involved in a widening range of activities, both setting recovery policy and leading operations, so the staffing grew substantially. In May 2014, there were 331 fixed-term employees and 102 contractors or persons temporarily seconded from other agencies, including Environment Canterbury and the Christchurch City Council (Murdoch 2014). Roger Sutton became CERA's chief executive in June 2011 and held this position until late 2014.[4]

During its first year, CERA developed the *Recovery Strategy for Greater Christchurch: Mahere Haumanutanga o Waitaha*—the overarching framework to guide the Canterbury recovery efforts (CERA 2012b). The draft recovery strategy was completed in September 2011, within the nine-month time frame dictated by the CER Act, and finalized in May 2012. The public consultation process for development of the strategy included a series of community engagement events, canvasses of local community boards and other bodies, and rounds of written comments. It presented an overall vision, goals, and guiding principles for the recovery effort and identified a series of work programs centered on six recovery components that reflected the CDEM recovery framework: leadership and integration, economic recovery, social recovery, cultural recovery, the built environment, and the natural environment. The programs were implemented through a series of projects that could use the statutory tools of the CER Act or other legislation if necessary.

CERA's key strategic partners included Environment Canterbury and the three local territorial authorities in Greater Christchurch, Ngāi Tahu, and the New Zealand Transport Agency (NZTA) to fund road-related repairs. Other national agencies with significant roles in the recovery included the EQC for residential insurance-related repairs and rebuilding; the Ministry of Social Development for social services, housing, and employment assistance; the Ministry of Business, Innovation and Employment (MBIE), which includes the former Department of Building and Housing, to manage the codes and standards for building construction and repairs; the Ministry of Education for the repair and rebuilding of schools; and the Treasury and the Ministry of Finance to provide financial oversight to CERA and other national agencies.

To help support the coordination, alignment, and monitoring of recovery progress called for in the recovery strategy and the CER Act, CERA,

in partnership with several other agencies, developed a recovery-monitoring and reporting framework that included a set of economic recovery indicators published monthly with updates on progress in the Christchurch CBD and by the EQC; more in-depth quarterly reports of economic indicators for the Canterbury region; an annual Canterbury Wellbeing Index that tracked the progress of the social recovery using a range of indicators of health, knowledge and skills, economic well-being, social connectedness, civil participation, housing, safety, and people; and a semiannual well-being survey of around 2,500 randomly selected residents in the region to provide feedback on their personal recovery experiences and the overall recovery progress.

The organization and senior leadership of CERA were restructured several times during its existence. In its final form, CERA had five operational units:

- Implementation contained several teams that managed the clearance of earthquake-damaged structures; design, planning, and project delivery in central Christchurch known as the Central City Development Unit (CCDU); coordination of publicly owned civic infrastructure repairs; and overall project delivery and investment strategies.
- Social and Cultural Recovery incorporated community and customer services, community resilience, social and cultural outcomes, and housing recovery.
- Strategy and Governance encompassed legal and policy matters, recovery strategy and planning, ministerial and executive services, and recovery monitoring.
- Corporate Services incorporated the finance, human resources and performance review, and information services and technology.
- Communications worked with stakeholders and the media, operated CERA's web and social media presence, and assisted with publications and presentations.

In September 2014, Minister Brownlee announced the launch of a transition planning program for CERA that included CERA's move to become a departmental agency within the Department of Prime Minister and Cabinet

(DPMC); the development of a plan to hand over responsibility and powers from CERA to local governments, other government agencies, or other delivery vehicles; an evaluation of the CER Act to consider the reduction or removal of some of the legislation's powers and the extension of any powers beyond the April 2016 sunset date; and the appointment of an advisory group to provide input on the development of the transition plan and the review of the CER Act powers.

CERA moved to the DPMC in February 2015. The draft recovery transition plan was released for public consultation before being finalized in October 2015 (CERA 2015a). It provides for a more shared governance arrangement between the national government and the local councils for the next five years of recovery, new legislation to support the regeneration of greater Christchurch and replace the CER Act, and the continuation of the national role of the minister of CER until 2021.

The Earthquake Commission

In the decade before 2010, the EQC responded to several small disasters. It functioned as a traditional insurer, assessing claims and paying cash settlements to homeowners to make their own repairs. It outsourced its claims administration and other core claims-related functions, including the use of teams of geotechnical engineers and engineering geologists to assess land damage. After the September 4, 2010, earthquake, however, the role of the EQC evolved substantially as it assumed direct responsibility for the actual repairs or rebuilding of insured homes. The national government wanted a more centrally managed process to help restore confidence in the housing market and manage prices of construction materials and labor. Through a competitive bidding process, the EQC selected a construction project management firm, Fletchers Construction, to manage repairs of homes that had suffered moderate to serious damage in the earthquakes. The project became known as the Canterbury Home Repair Programme, and it managed repairs for more than 67,700 homes with EQC claims above NZ$15,000 (US$12,000) and below the EQC's limit of NZ$100,000 (US$80,000) (EQC 2016). Private insurers paid claims over the EQC limit in accordance with their policy terms.

The EQC also conducted land damage assessments of insured properties as part of its claims process. Because of the scale and extent of land movements caused by the earthquakes, the EQC commissioned a three-step process of investigations to understand the extent and severity of land damage both on the plains and in the hills: (1) regional broad-scale mapping; (2) rapid property-by-property mapping of land damage patterns; and (3) detailed land damage assessments for settlement of insurance claims on individual properties (Rogers et al. 2014).

The EQC's geotechnical analyses of land damage after the September 4 earthquake mapped 22,500 properties and assigned them to three recovery zones according to the extent of land repair and building foundation design needed. Properties in recovery zones A and B—as well as elsewhere in the Canterbury region—could proceed with repairs once the EQC assessed their claim. The 3,300 properties in recovery zone C, however, would require a "wide-scale coordinated and strategic approach to repair the land," likely necessitating the demolition and subsequent reconstruction of affected homes (Brownlee 2010).

Just before the detailed engineering guidance was to be released, the February 22, 2011, earthquake struck, causing even greater liquefaction and damage related to ground failure. The EQC and its investigators started reassessing building and land damage, assessing new claims, and reconsidering repair and remediation options. In March 2011, Minister Brownlee announced that approximately 10,000 homes had suffered severe land damage, three times the number previously classified in recovery zone C (Brownlee 2011a), and put additional land remediation planning work on hold in the city of Christchurch. Concerns about increased flood risk also arose in portions of the eastern suburbs of Christchurch that had subsided and become much more vulnerable to future flooding from river and storm surges (Rogers et al. 2014).

On June 13, 2011, two large aftershocks caused additional liquefaction and land damage. On June 23, 2011, Prime Minister Key and Minister Brownlee held a joint press conference and announced the cabinet's decision to reclassify the region's earthquake-damaged residential properties into four new zones depending on their suitability for reconstruction (Key and Brownlee 2011). The EQC was effectively relieved of repairing land

damage for properties located in the "red zone" and deemed unsuitable for reconstruction.

After the February 22 earthquake and its aftershocks, EQC claims continued to mount. By July 2011, the EQC had received nearly 370,000 claims for 13 separate earthquakes in the Canterbury region and had paid out more than NZ$1 billion (US$800 million) in claims (EQC 2011). Legal challenges arose over whether the EQC's limits for residential building damage and contents-related losses were a total limit for all losses incurred or were reinstated at each instance of earthquake damage. In September 2011, the New Zealand High Court ruled that the EQC was liable for payment up to its limits for each damage occurrence (High Court of New Zealand 2011). The combination of this additional exposure, the extent of damages, and the number of claims exhausted the EQC's Natural Disaster Fund and its reinsurance coverages, required national-government guarantees for the fund, and led to the failure of the AMI mutual insurance company (King et al. 2014).

Although the EQC was praised for setting up the home repair program quickly, it has also been the subject of intense public dissatisfaction. The land damage remediation clause contained in the EQC policy, the shared responsibility of the EQC and private insurers for claims for building damage, and the large number of earthquakes generating claims all complicated the settlement of insurance claims (New Zealand Office of the Auditor General 2013a), as did meeting the national government's guidelines for housing foundation engineering. About 28,000 properties (14 percent of all residential properties) were in technical category 3 (TC3), where site-specific geotechnical investigations and engineering solutions were needed (Tonkin and Taylor 2010). Site-specific geotechnical investigations generally involved on-site drilling to determine soil conditions and develop affordable engineering solutions acceptable to the government, which caused significant delays for the claims settlement by EQC and private insurers. As of December 2013, about 2,500 homes in TC3 areas (less than 10 percent) had been repaired; most owners of unrepaired TC3 homes were either renting alternative housing or living in the damaged homes (NZ HRC 2013).

Matters were further complicated in March 2014 when Christchurch had the heaviest rainfalls since the 1970s, flooding homes, properties, and

streets. In many locations, flooding was worsened by ground settlement and unrepaired building damage from the earthquakes and resulted in a new wave of claims for building, contents, and land damage to the EQC and private insurers. Bolstered by a High Court ruling issued in December 2014, the EQC is assessing and making payments to more than 9,000 customers who have increased flood vulnerability and thus potential loss of property value caused by the earthquake-induced land damage (EQC 2014).

As of December 2016, the EQC had completed over 67,700 home repairs and settled nearly all of its building, contents, and land damage claims through cash payments or repairs at a total cost of more than NZ$9.3 billion (US$7.44 billion) (EQC 2016). The levy assessed on all homeowners for EQC coverage more than doubled to NZ$207 (US$166) annually following the 2010–2011 earthquakes, and it is estimated that it will take 30 years to rebuild the Natural Disaster Fund to its nearly NZ$6 billion (US$ 4.8 billion) level before the Canterbury earthquakes (Small and Meier 2015).

Regional and Local Councils

Environment Canterbury

The Canterbury Regional Council–Environment Canterbury (ECan) has been in a state of rebuilding as well since September 2010. After concluding that ECan had mismanaged its responsibilities for regional water management policy, New Zealand's Parliament passed the controversial Environment Canterbury (Temporary Commissioners and Improved Water Management) (ECan) Act, which came into force in April 2010 (New Zealand Parliament 2010b). The ECan Act authorized the national appointment of temporary commissioners to replace ECan's elected commissioners and gave the national government additional powers to undertake, override, or suspend many regional- and local-authority responsibilities.[5] The CERR Act, passed after the September 4, 2010, earthquake, was modeled in part on the powers and authorities included in the ECan Act.

In 2011 and 2012, ECan underwent a major overhaul, and a new chief executive took office in June 2011. In addition to having responsibility for the regional CDEM group, ECan has been an active leader in most of the

region's post-earthquake planning efforts, and staff have been seconded to CERA to work on various recovery planning and program efforts. Under the CER Act, the minister for CER directed ECan to prepare the *Natural Environment Recovery Programme for Greater Christchurch* to facilitate the restoration and enhancement of the natural environment (Environment Canterbury 2013); the regional *Land Use Recovery Plan* (CERA 2013b); and the *Lyttelton Port Recovery Plan* to help facilitate the Port's rebuild and recovery (CERA 2015c). Overall satisfaction with ECan's post-reform performance is quite high; notably, ECan received the New Zealand Institute of Public Administration's top Excellence in Regulatory Systems award in 2014.

The Christchurch City Council

To say that the Christchurch City Council returned too quickly to business as usual after the September 4, 2010, earthquake paints far too simplistic a picture and dismisses a great deal of work by council staff and leaders on response and recovery-related activities, including road clearance and demolitions; assessment of and repairs to public facilities, infrastructure, and buildings; provision of temporary water and sanitary systems; and other social welfare assistance. In September 2010, the Christchurch City Council established two offices that would lead the main aspects of the city's involvement in recovery until the February 22 earthquake. The Infrastructure Rebuild Management Office helped coordinate the design and implementation of repairs to the city's damaged street-level civic infrastructure: roads and potable water, wastewater, and storm-water systems. The Building Recovery Office (BRO) helped coordinate and expedite requests for building demolition work, major repairs, or rebuilds. The BRO focused on the CBD and other commercial areas and was aligned with the six precincts identified in the council's *Central City Revitalisation Strategy*, a revitalization effort that had started before the earthquakes (Christchurch City Council 2006). The council's Strategy and Planning Unit assigned precinct managers to focus on longer-term revitalization, including the repair or redevelopment of buildings and vacant sites and business retention in each precinct, and BRO case managers were assigned to the precincts and

worked with BRO engineers to prioritize buildings for a case management process that considered public safety, traffic management, and cordon issues.

Christchurch's mayor, Bob Parker, who, along with many of the city councilors, had solidly won reelection in the October 2010 local elections, was praised for his calm leadership in the first difficult days and weeks.[6] However, over time and with the establishment of CERA, the leadership of Christchurch's recovery shifted significantly to the national level. It may be that the council was completely overwhelmed by the challenges after the February 22 earthquake, and some residents questioned the overall competency of the council's leadership even before the earthquakes struck. As in all complex situations, there was likely a mix of both factors.

Over the course of 2011 and 2012, many council staff were heavily involved in national-government and CERA-led activities, while others focused on city-led efforts, such as assessing and prioritizing work on city-owned facilities, parks, damaged levees, flooding, and hillside rockfall hazards. After the passage of the CER Act in April 2011, council staff started developing the draft *Central City Plan* (Christchurch City Council 2011). Soon after this, a group of city councilors, along with civic and business leaders, traveled to San Francisco to learn about recovery and planning experiences after the 1906 and 1989 earthquakes and other disasters. In June 2011, the council began work on the Suburban Centres Programme, which provided coordinated planning and assistance to help suburban commercial districts recover from the earthquakes. Nine suburban master plans were completed between 2012 and 2015 through a collaborative process involving the council, community boards, and local stakeholders. Case managers were assigned to other damaged districts to work with other support agencies to help business and property owners with repairs and rebuilding.

Also in 2012, the council, working with the national funding body Creative New Zealand, established two funds that provide small grants of up to $15,000 annually to support temporary activities, art, and retail options that help activate vacant spaces and attract residents, businesses, and visitors back to the central city and suburban centers. Organizations like Gap Filler and Greening the Rubble provided temporary activities and

The highly successful temporary Re:Start Mall in Christchurch was built out of shipping containers amid the downtown reconstruction. Photo by Laurie Johnson (2015).

installations on land made vacant by the earthquake. Temporary installations, such as Shigeru Ban's Cardboard Cathedral and the Re:Start shopping mall, made from 60 shipping containers, have received international acclaim. These installations, along with concerts and other civic events, have been very effective in keeping civic life in the central city during its reconstruction. They motivated the *Lonely Planet* global travel guide to list Christchurch on its "Top 10 Cities for 2013" and the *New York Times* to name it as one of "52 Places to Go in 2014."

In the first years of the recovery, public confidence in the Christchurch City Council's decision making was consistently lower than it was for other local councils (Nielsen 2014), and the council experienced some very pivotal and public setbacks. One of the first began in December 2011 when city councilors narrowly voted to provide a substantial pay increase to the city's chief executive, Tony Marryatt. Protests ensued, culminating in a 4,000-person march on city hall in early February 2012, calling for mid-term elections and the removal of Marryatt and threatening a potential property rates (tax) revolt (Sachdeva 2012). The national government intervened and appointed a Crown observer, as allowed under the Local

The restored Historic Regent Street precinct on the edge of the Christchurch CBD is pictured here. Photo by Laurie Johnson (2015).

Government Act, to oversee the workings of the council, provide advice to the mayor and councilors, and help rebuild trust and collaboration between elected members and staff.

The second pivotal moment came shortly thereafter, on April 18, 2012, when Minister Brownlee announced that he had directed CERA's chief executive to establish a new business unit inside CERA to focus on rebuilding Christchurch's CBD. He tasked it with first preparing a blueprint within 100 days for the implementation of the council's draft *Central City Plan* and then facilitating, coordinating, and directing the development of the central city. Staff from the council and ECan were seconded to CERA to help with the next round of planning, and although the council was still a strategic partner and collaborator, it was effectively relieved of its responsibility for recovery planning and implementation in the CBD. The council maintained responsibility for issuing building and planning consents within the central city, and in April 2013, it launched Rebuild Central, which placed the council's urban designers, planners, and resource consent and building consent experts in a one-stop center to assist property owners, businesses, and investors in the central city and other key suburban areas.

The third blow to the council's credibility came on July 1, 2013, when International Accreditation New Zealand (IANZ) issued a decision to revoke the council's accreditation to issue building consents.[7] At the council's request, the national government installed a Crown manager—allowed under provisions of the Local Government Act—to manage the council's building control functions, review the building consent operations, and help the council regain its accreditation (D. Martin 2015). It was also revealed that Marryatt and the council's general manager for building consenting had known about the IANZ's intention to revoke the council's accreditation since May but had failed to inform the mayor and the councilors. Marryatt took indefinite leave and eventually formally resigned in September 2013.

One of Marryatt's last acts as chief executive was to complete a cost-sharing agreement with the national government that both parties signed on June 27, 2013 (New Zealand Government and Christchurch City Council 2013). It establishes the financial terms between the council and the national government for key recovery projects. This agreement too has been mired in controversies over issues including lack of consultation with city councilors in its development, lack of consultation with the public, and uncertainty why the council would pay more for key projects than it had originally proposed in its draft *Central City Plan* (Bennett et al. 2014; McCrone 2014).

Mayor Parker and a few other councilors decided not to run again in the October 2013 elections. Lianne Dalziel, the long-standing member of Parliament from Christchurch's eastern suburbs and the Labour (opposition) Party's spokesperson for earthquake recovery, won easily on a campaign of unity across the council, as well as with the national government. In one of her first duties as mayor, she and Minister Brownlee cohosted a public forum on November 4, 2013, the first such event that the minister had convened in more than two years and a visible gesture of relationship mending by both levels of government. Dalziel also supported Christchurch's application to the Rockefeller Foundation to join the 100 Resilient Cities Network, which was approved in December 2013.

After severe flooding in March 2014, Mayor Dalziel established a mayoral flood task force to identify immediate and short-term solutions until

the long-term programs to repair infrastructure, waterways, and land damage could be completed. Acting on recommendations of the task force, the council offered property rates relief to flooded houses, helped secure temporary living assistance from the national government, and developed a series of short-term flood-mitigation measures. At the same time, the council was working on a partial update to the chapter on natural hazards in its district plan that expanded the city's flood-management area and set new minimum floor heights for new buildings (Christchurch City Council 2016).

The update of the chapter on natural hazards was part of a larger review of the Christchurch District Plan, which sets the long-term direction for the city's projected growth and management of natural resources and hazards and must be consistent with an array of local and regional policies and plans (Christchurch City Council 2016). In July 2014, the minister for CER and the minister for the environment approved an expedited review process for the council's district plan (New Zealand Legislation 2014). The Christchurch City Council is updating the Christchurch District Plan in three stages; the first set of chapters was released for public comment in late August 2014. A five-member independent hearings panel appointed by the ministers conducted an expedited hearing process for each chapter of the plan and voiced criticism early on that the chapters did not make the "step change needed to support recovery" (Cairns 2015).

On December 31, 2014, the council's building control authority was reinstated, and the Crown manager's appointed term came to an end (D. Martin 2015). However, negative feedback on the district plan and other council planning activities prompted the council's new chief executive to launch a three-pronged evaluation of the planning department's efforts as part of a major council reorganization (McCrone 2015).

In 2015, the council also updated its 2015–2025 Long-Term Plan to address its most difficult challenge yet—finances (Christchurch City Council 2015). The plan addressed the council's estimated funding shortfall of NZ$1.2 billion (US$960 million) over five years, in large part due to overestimation of insurance and national-government funding for rebuilding by the prior council administration. The council agreed to sell shares in

some or all of the companies it owns, raise property rates over the next four years, delay some major construction projects, and find additional operational cost savings. Elected officials and the public hotly debated the terms of the financing strategy. Many strongly advocated that the council avoid asset sales at all costs. Many maintained that the council's extra burden was due to the anchor projects that had been imposed by the national government and were not part of the council's draft *Central City Plan* (Law 2015).

The Waimakariri District Council

The Waimakariri District Council is considerably smaller in district population, staff, and budget than the Christchurch City Council. The September 2010 earthquake caused the greatest damage in the district. The report *Waimakariri District Council's Integrated, Community-Based Recovery Framework* (Vallance 2013) documents the council's planning for post-disaster recovery before the September 2010 earthquake and its post-earthquake development of a recovery plan with an earthquake recovery committee to guide its efforts and establishment of a recovery hub as a one-stop shop for residents of the heavily damaged town of Kaiapoi.

Public confidence in Waimakariri's earthquake recovery decision making has been consistently higher than that for CERA, ECan, and the Christchurch City Council (Nielsen 2014). The mayor, David Ayers, was elected in October 2010, shortly after the damaging September 4 earthquake, and was reelected in 2013 and 2016.[8] The council's chief executive, Jim Palmer, has served in that role since 2003 and has been strongly praised for his guidance and support in the earthquake recovery.

After the September 2010 earthquake, the council worked with residents of the heavily damaged town of Kaiapoi to develop a detailed land remediation program that integrated land remediation work with an estimated 10 to 15 km (6 to 9 miles) of street and local-council infrastructure repairs and about 1,280 housing repairs or rebuilds (Markham 2012). Affected residential properties were divided into geographic clusters and slotted into a series of phased repairs, lasting six months each, running through

June 2013. The strategy also provided for temporary accommodations for homeowners during the repairs and included community regeneration and social recovery programs to help residents cope with the disruption. The council completed its strategy in June 2011 and proposed creating a loan fund to address the NZ$28 million (US$22 million) in recovery costs, which would be repaid through a 25-year rate increase of a maximum NZ$120 (US$96) on all properties (Vallance 2013). However, the national government's land zoning decisions of June 23, 2011, put much of Kaiapoi's damaged housing in the red zone and effectively stopped the council's plan. In commenting on the decision, Minister Brownlee said, "While the news will disappoint some it also provides a clear, and we believe fair path ahead for the hardest hit residents of the Waimakariri District" (Brownlee 2011b).

Since that time, the council has worked with local residents and businesses to develop and implement comprehensive recovery strategies for the council's two main business districts in Kaiapoi and Rangiora, amended its district plan to reflect these strategies and ensure consistency with the regional *Land Use Recovery Plan*, and provided temporary business accommodations and support. It has also partnered with CERA on regeneration planning for red zone lands, and the final *Waikamariri Residential Red Zone Recovery Plan* was approved by the minister for CER in December 2016 (Waimakariri District Council 2016).

Additionally, the council designed and implemented a NZ$43 million (US$34.4 million) infrastructure recovery program and rebuilt its damaged public buildings, including libraries, recreation facilities, and town halls (Waimakariri District Council 2013). It has also been responding to the exceptional rainfall and post-earthquake changes in land elevations that have caused new flooding problems. The council has experienced accelerated residential and commercial development due to the earthquake recovery, processing between 1,000 and 1,300 residential building consents per year from 2012 to 2014, more than double the historic average since 2000 (Markham 2014). It has also seen dramatic increases in both for-sale and rental housing prices and a loss of moderately priced housing due to the earthquakes.

Other Key Organizations

The Stronger Christchurch Infrastructure Rebuild Team

The Stronger Christchurch Infrastructure Rebuild Team (SCIRT) is an outgrowth of the Infrastructure Rebuild Management Office established by the Christchurch City Council after the September 4, 2010, earthquake to repair the city's damaged roads and potable water, wastewater, and storm-water systems. The expanded damage after the February 2011 earthquake made it clear that a larger-scale approach would be needed, and the city and the national government agreed to develop an alliance, consisting of three funder-owner organizations (CERA, the Christchurch City Council, and the New Zealand Transport Agency) and five nonowner participants responsible for the delivery of reconstruction work. An interim alliance agreement was reached on May 4, 2011, and the formal alliance began in September 2011 with an anticipated five-year program for reconstruction of Christchurch's roads and potable water, wastewater, and storm-water systems. The rationale for the alliance model was that the scope of work was difficult to define in a simple contract and would need the flexibility to evolve over time, with risk shared among the owners and the service and delivery teams.

SCIRT consists of a board of directors with members from all the participant organizations, an overall management and coordination team, an integrated services team that provides design services, and five delivery teams that carry out the day-to-day work. In addition, the client governance group, which provides overall leadership for the program, was established in December 2011. It consists of one representative from each of the three funder-owners and an independent chairperson appointed by the minister for CER.

SCIRT released the *Stronger Christchurch Infrastructure Rebuild Plan* in December 2011, estimating a cost of NZ$2 billion (US$1.6 billion) to complete a 600-project program to repair all publicly owned street-level infrastructure in Christchurch by the end of 2016 (SCIRT 2011). The June 2013 cost-sharing agreement between the national government and the Christchurch City Council defines the national government's contribution

to the infrastructure rebuild at a maximum of NZ$1.8 billion (US$1.44 billion),[9] while the Christchurch City Council is responsible for a total of NZ$1.14 billion (US$912 million) (New Zealand Government and Christchurch City Council 2013). That same year, SCIRT revised its overall program estimate to NZ$2.496 billion (US$1.997 billion) (New Zealand Office of the Auditor General 2013b).

SCIRT's project-level design and planning are informed by the *Recovery Strategy for Greater Christchurch* and the *Christchurch Central Recovery Plan* and are coordinated with other utilities, CERA, and the Christchurch City Council. SCIRT has worked with ECan and the Christchurch City Council to package project consents and streamline the consenting and consultation processes. The allocation of work among the delivery teams was determined by performance criteria that target costs and five service performance areas: safety, value, teaming, customer satisfaction, and the environment.

Although businesses and residents have expressed dissatisfaction with the impacts of construction on transportation and the psychological effects of the damaged environment, satisfaction with SCIRT has been consistently high, and highest among most of the government organizations, throughout the recovery (Nielsen 2014). SCIRT completed nearly its entire reconstruction program before its sunset date in December 2016, at which time responsibility for any remaining work transferred to the respective owners.

Te Rūnanga o Ngāi Tahu

Te Rūnanga o Ngāi Tahu (the tribal council of the Ngāi Tahu) has been a strategic partner along with the national government, ECan, and the local councils in the development of the *Recovery Strategy for Greater Christchurch* and other key plans and programs throughout the recovery. Ngāi Tahu owns land and building assets valued at more than NZ$1.2 billion (US$960 million) (Te Rūnanga o Ngāi Tahu 2016). Its development portfolio includes some of the region's largest planned residential land developments, and its investment portfolio includes a number of government-tenanted properties, including the court and police buildings in the Christchurch CBD and the Christchurch City Council civic building, as well as other

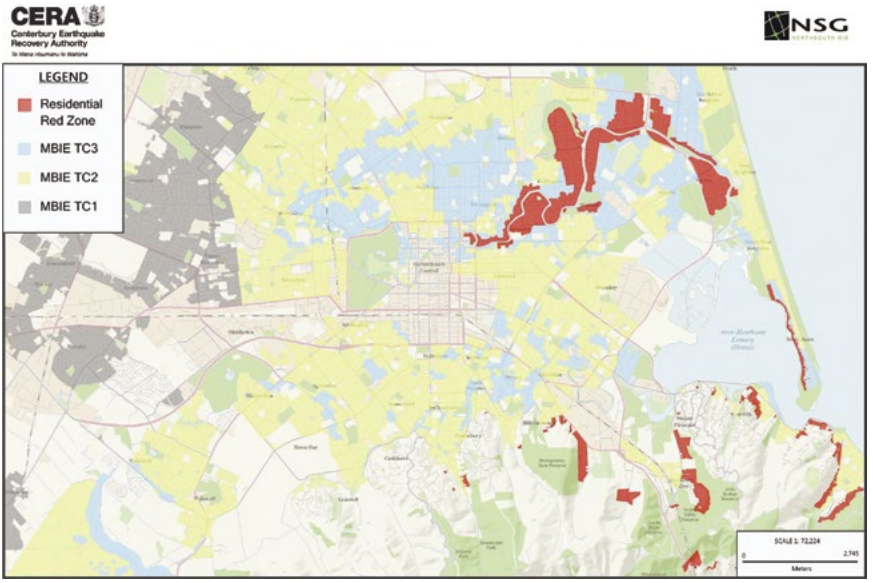
prime sites in the CBD. As a condition of prior treaties and settlements with the national government, the tribe has a right of first refusal to purchase all surplus Crown property in the Ngāi Tahu claim area; the Crown sets the price, terms, and conditions of the offer.

NOTABLE RECOVERY FEATURES

Planning for post-disaster reconstruction has taken place on several levels. Under the CER Act, the overarching planning document is the *Recovery Strategy for Greater Christchurch* (CERA 2012b). All recovery plans must be consistent with the *Recovery Strategy*; the minister for CER has the power to mandate changes to these plans to ensure consistency; and all existing plans and policies must not be applied in ways that are inconsistent with the strategy (New Zealand Parliament 2011). The most difficult land use challenges have been establishing an equitable and efficient process for assessing and repairing or vacating high-hazard residential land areas; furthering reconstruction and economic revitalization of the heavily damaged central city of Christchurch; and coordinating plans for new urban growth and regional land use changes necessitated by the earthquake. Each has been addressed through planning processes and other regulatory mechanisms that meet the consistency requirements of the CER Act.

Residential Land Zoning and Red Zone Buyouts

EQC-funded geotechnical studies after the September 4, 2010, earthquake recommended a wide-scale approach to land repair that would likely involve the demolition and subsequent reconstruction of homes heavily affected by liquefaction and other ground failures (Brownlee 2010). Land repair proposals resulting from these investigations exceeded the EQC's coverage; however, the national government committed NZ$140 million (US$112 million) to ensure that land damage would not be as extensive in future earthquakes (Brownlee 2011a). It was expected that the national government would work with the EQC, local councils, and private insurers on remediation plans for the 17 neighborhoods most affected by land damage, but that the remediation work would take up to two years to complete. Even



This map shows the red zone areas and three green zone technical categories (shown in blue, yellow, and gray) for the residential foundation repairs in central Christchurch as of February 2016. *Source*: New Zealand Government (2016).

greater and more widespread land damage caused by the February 22, 2011, earthquake and subsequent aftershocks changed this. After two large aftershocks on June 13, 2011, Prime Minister Key gave the first public indication of the new land policy and approach, stating that the national government now had a "reasonably clear picture about what land won't be able to be rebuilt on and what land will be able to be fixed up" (Key 2011).

At their press conference on June 23, 2011, Prime Minister Key and Minister Brownlee announced the results of the nine-month EQC geotechnical investigations that had served as the foundation of the cabinet's decision to classify the region's earthquake-damaged residential properties into four new zones:

- Properties in red zones were unsuitable for reconstruction because "land repair would be prolonged and uneconomic" and would be sub-

ject to a national-government-backed voluntary buyout program. About 5,176 properties were initially identified in these areas.
- Properties in green zones were suitable for rebuilding in accordance with one of three technical categories of foundation repair and building requirements depending on the location of the property. Most of Greater Christchurch (about 100,000 properties) is within these areas.
- Properties in orange zones required further investigation. These included about 9,770 properties in flatland areas.
- Properties in white zones also needed further investigation. These included about 3,770 properties in the Port Hills and parts of the Christchurch CBD. (Key and Brownlee 2011)

In making the zoning decisions, the New Zealand Cabinet determined that the land damage to date, as well as the risk of future additional damage, had created unacceptable uncertainty for some people and was an impediment to the wider Canterbury recovery (New Zealand Cabinet 2011). It agreed to a set of principles for the ongoing investigations, zoning determinations, and a buyout process, including "certainty of outcome for home-owners as soon as possible," "using the best available information," and "having a simple process in order to provide clarity" (New Zealand Cabinet 2011, 2).

The vast majority of residential properties in the region—over 100,000 properties—were located in a green zone and were cleared for rebuilding. Each property was further assigned to one of three technical categories (TCs) of foundation and building requirements, established by the national Department of Buildings and Housing (DBH), depending on the location of the property relative to the geotechnical studies:

- Technical category 1 (TC1) areas are areas where future land damage from liquefaction is unlikely, and standard foundations are acceptable subject to shallow geotechnical investigations.
- Technical category 2 (TC2) areas are areas where minor to moderate land damage is possible in future earthquakes, and foundation repairs must be performed in accordance with one of three standard foundation designs.

- Technical category 3 (TC3) areas are areas where moderate to significant land damage from liquefaction is possible in future large earthquakes, and foundation solutions must be based on site-specific geotechnical investigations and specific engineering foundation designs. (NZ DBH 2012)

Despite the comprehensive vision presented in the June 2011 announcement, policy development and implementation of the residential land zoning and buyout process evolved over time and took several years to complete. Throughout the process, the minister for CER and the cabinet were responsible for approving the general terms of proposed policies and estimated costs, and CERA managed program development and implementation. Most major policy decisions did not involve public consultation but instead followed a communication process beginning with a public statement and press release by Minister Brownlee, supported by information briefings, website postings, and other outreach efforts managed by CERA staff. As the CERA residential red zone program took shape, it developed into three key projects: acquisition of residential land and property, insurance recovery, and management of acquired property.

The first phase of the red zone land acquisition project focused on residential properties in the flatlands that were identified in the June 23 announcement. For these, the cabinet agreed to offer two voluntary purchase options to landowners who had EQC coverage before the September 4, 2010, earthquake:

- Option 1: The national government would purchase both the land and structures at the most recent property rating valuation (less any insurance payments already made for the home or other buildings on the property, or for contents) and would take over any remaining EQC and insurer claims.[10]
- Option 2: The national government would purchase the land only at the most recent property rating valuation and take over the EQC claim for land damage, and property owners would maintain their insurance claims for buildings and contents. (New Zealand Cabinet 2011)

CERA sent out the first round of offer letters, about 3,000, in mid-August 2011. Property owners had 9 months (later extended to 12 months) from the date they received their offer letters to decide whether to accept one of the two government offers. Some property owners made their decisions quickly, and CERA issued the first residential buyout payouts in September 2011. Other property owners delayed decisions or encountered difficulty obtaining the necessary information, such as settlement offers for insurance claims, before their decision deadline. In addition to many informational meetings, CERA provided homeowners with decision support at two assistance centers in the red zone areas that included staff from the local councils and the EQC, a temporary accommodation service, legal advisers, and some insurers and banks. In accepting an offer, property owners also agreed to a specific settlement date on which the property would need to be completely vacated and secured, payment would officially be made, and the national government would assume ownership.

Additional geotechnical investigations continued, and as zoning decisions were made, sets of offer letters were prepared and sent to the affected property owners. For most properties that received initial orange or white zone designations, decisions took from a few months to almost 16 months to complete. Many began to refer to these areas as "limbo land," and some owners spoke of their envy of "red zoners" and the certainty that they had (Matthews 2012). Homeowners who wanted the certainty that a red zone designation could provide filed requests for zoning review. In June 2012, Minister Brownlee announced the introduction of a review process for those insured residential property owners in the flatlands who wanted their zoning status reviewed. In all, 1,300 property owners applied during the two-week application period, and the decisions were announced on August 24, 2012 (New Zealand Cabinet Committee on Canterbury Earthquake Recovery 2012).[11] Three properties were changed from the red zone to the green zone, and 101 properties were changed from green to red.

Owners of some uninsured residential and nonresidential properties also had to wait for over a year for an offer decision. The national government's policy for leasehold properties (to which a tenant has temporary rights), 22 insured commercial or industrial properties, 65 vacant parcels,

and 50 uninsured residential properties located in the red zones was announced in September 2012 and differed from the offer provided to insured residential red zone properties (CERA 2012a). Most notably, owners of commercial or industrial properties, vacant land, and uninsured residential properties were offered half of the most recent rating valuation for their land, and only the improvements on commercial and industrial properties were given full valuation; no offer was made for residential structures on uninsured residential properties. Minister Brownlee defended the decision to make reduced offers to uninsured properties on the grounds that it protected the national government and taxpayers from future disaster liabilities for similarly uninsured properties whose owners expected government assistance.

Owners challenged the offers and their underlying assumptions, and the case took nearly four years to make its way through the courts. In March 2015, the New Zealand Supreme Court ruled that the cabinet and the minister for CER should have followed the procedures defined under the CER Act and should have addressed the land zoning and related decisions as part of the *Recovery Strategy for Greater Christchurch* or through a recovery plan process, including public consultation (New Zealand Supreme Court 2015). In response, CERA immediately began work on the Residential Red Zone Offer Recovery Plan, which was finalized in July 2015 (CERA 2015e). The plan sets forth new voluntary purchase offers at 100 percent of the 2007/2008 ratable value for all vacant red zone land, insured commercial red zone properties (both land and improvements), and land only for uninsured improved red zone properties.

By July 2013, two years after the program's launch, CERA had obtained signed voluntary sale and purchase agreements from 95 percent (7,143) of red zone property owners; 23 percent of these owners (1,657) selected option 1 to sell both their land and structures, and 77 percent (5,486) selected option 2 to sell only their land but maintain their insurance claims to buildings and contents (NZ HRC 2013).

In addition to the settlement and payment processes, CERA managed insurance recovery on behalf of the national government and provided ongoing maintenance, clearing, and demolition of the acquired properties. In April 2014, CERA estimated that it was about halfway through the pro-

cess of building demolition and land clearance for all voluntary acquisitions in the red zone. Most of the buyout properties were cleared by 2016.

CERA estimated a total cost of NZ$1.5 billion (US$1.2 billion) to purchase the residential red zone properties, taking into account the insurance recoveries paid on the land and buildings by the EQC and other insurers (CERA 2014b; New Zealand Cabinet 2013). In January 2014, CERA estimated that ongoing maintenance and security costs for red zone properties were nearly NZ$1 million (US$800,000) each month, although it expected this amount to decline as demolitions and clearances were completed; it also reported that the cost of maintaining infrastructure services to occupied homes in the red zone was about NZ$500 (US$400) per home each week (CERA 2014b).

As of March 2016, 99 percent of the red zone land owners had accepted a national government offer, but 121 property owners had not (NZ HRC 2016). The national government has maintained that those who did not accept the voluntary offer might have their utility services discontinued, insurers may cancel or refuse to renew insurance policies, banks may not finance reconstruction, future resale values may decline, and the national government can invoke powers provided by the CER Act to require current market valuations on all property sales, which, it warned, could be substantially lower than the amount of the national government's voluntary offer.

At the end of 2016, the future use of the land in the residential red zones had not yet been fully defined. The national government owns properties acquired through the red zone program, and in early 2014, CERA began to communicate plans for their future use. Minister Brownlee stated that decisions about infrastructure assets need to be resolved first; then the national government will work with local councils and Ngāi Tahu leaders to design community participation to gather ideas about future uses.

In July 2014, CERA, in conjunction with its local partners, launched a public engagement campaign soliciting ideas about the future use of the approximately 1 square km (245 acres) of red zone land in the Waimakariri District. The final draft of the *Waikamariri Residential Red Zone Recovery Plan* was completed and received final approval from the minister for CER in December 2016 (Waimakariri District Council 2016). The plan proposes land uses and activities for five regeneration areas that include

This view across one of the Waimakariri red zone areas was taken in September 2015. Most homes have now been demolished, and planning for reuse was scheduled for 2016. Photo by Laurie Johnson (2015).

new parks and reserves, walking and cycling links, a biking track, a dog park, mixed-use business areas, roads and infrastructure sites, and provision for heritage, gardening, and rural activities. Ideas for using the red zone lands in Christchurch have centered on community-serving recreational and open space, and the planning process is scheduled for 2017.

Central Christchurch Planning and Implementation

Christchurch's CBD had been in decline for some time before the earthquakes, and the Christchurch City Council had been actively engaged in its revitalization since the late 1990s. Plans developed over the ensuing years envisioned a greener and more pedestrian-oriented city center divided into a series of distinguishable precincts, including a heritage precinct and areas of concentrated redevelopment and renewal (Christchurch City Council 2006). Proposed projects included a new city council building (which the council moved into shortly before the September 2010 earthquake), a new central bus exchange, renovation of the downtown retail corridor, enhancement of the Avon River, and additional housing to accommodate more than a tripling of downtown residents to 30,000 by

2026 (Christchurch City Council 2006). These projects were linked to the council's long-term plan and planned capital expenditures.

In November 2008, the council engaged Gehl Architects to study the quality of Christchurch's central-city spaces, people's use of them, and ways they could better sustain public life and create a greater sense of community (Gehl Architects 2009). Gehl suggested that Christchurch look at creating a central city where pedestrians, cyclists, and public transportation were given priority. The firm noted that there are strong links between public spaces and amenities and a strengthening of a city's identity.

When the CER Act charged the Christchurch City Council with the responsibility for preparing a recovery plan for the CBD within nine months, the council asked Gehl Architects to assist because of its recent involvement and its knowledge of the CBD. The council launched the process in May 2011 with a public engagement campaign that became known as "Share an Idea,"[12] which attracted more than 106,000 suggestions from the public and included a web-based bulletin board for posting ideas and a two-day expo attended by 10,000 people. The council recorded and analyzed all the ideas. Five overarching themes emerged as necessary elements to ensure that the central city would become economically vibrant again:

- A green city, supported by the upgraded Avon River, tree-lined streets, green-rated buildings, parks, and storm-water treatment.
- A stronger built identity, with lower-rise buildings, strengthened heritage buildings, and controlled urban design.
- A compact CBD with a new convention center, improved transportation access, streetscaping, and broadband and free WiFi.
- A place to live, work, play, learn, and visit, with new housing options, improved access to schools, and new cultural and recreational facilities.
- An accessible city, supported by walking and cycling paths, public transit, parking, and road improvements. (Christchurch City Council 2011)

The resulting vision was a low-rise, resilient, safe, and sustainable city with easy mobility, a business-friendly compact central area, an array of inviting green spaces, and plenty of activities to draw people into the CBD. More

than 70 projects were proposed to be implemented during the next 10 to 20 years.

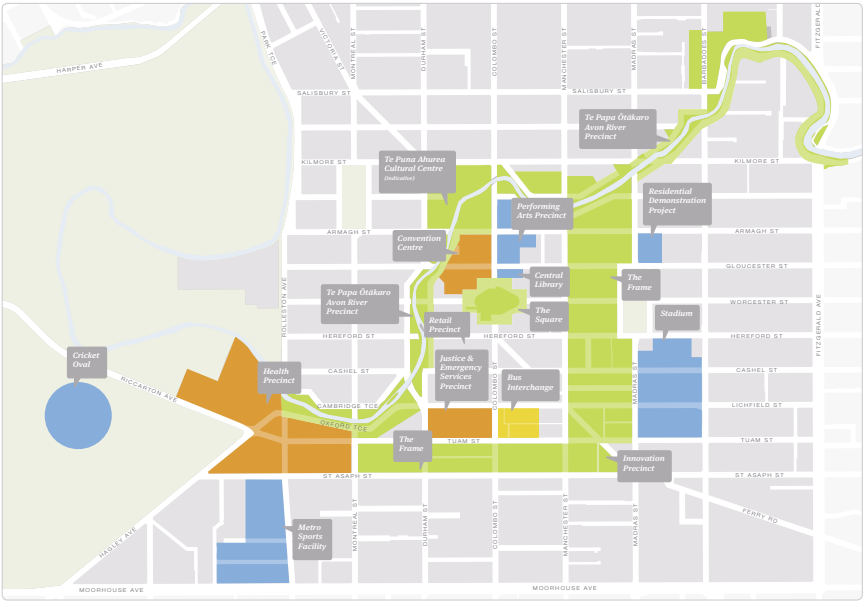
The council adopted the two-volume draft *Central City Plan* on August 11, 2011, and opened it up for formal public comment. Minister Brownlee and CERA released their comprehensive response to the plan on September 28, 2011, acknowledging support for the draft plan's vision of a more concentrated CBD, but calling for a clearer focus on private-sector employment opportunities and economic opportunities for the country and questioning the proposed regulatory framework, the investment strategy, and the time frames for reconstruction (CERA 2011).

The council made revisions and submitted the final draft *Central City Plan* to Minister Brownlee for approval in December 2011. Under the CER Act, final approval of the plan was entirely up to the minister. Four months later, in April 2012, Brownlee announced that he supported the general concepts of the plan, but he would not accept the transportation-related elements or the entire second volume, which contained the regulatory and implementation framework and the proposed amendments to the council's district plan necessary to implement the plan (Cleary 2014). On April 18, 2012, he announced the establishment of the Christchurch Central Development Unit (CCDU) within CERA to provide clearer leadership for the central-city rebuild and prepare a final draft Christchurch central recovery plan, including a blueprint plan within 100 days. Key goals for the blueprint were to identify and locate within the central city a series of anchor projects that would replace or supplement facilities destroyed by the earthquakes and stimulate private-sector investment.

The finalized *Christchurch Central Recovery Plan*, including the blueprint, was unveiled to the public on July 30, 2012, and became law on July 31, 2012 (CCDU 2012). There was no formal public consultation on the plan; it cited the council's "Share an Idea" campaign and comments on the council's draft plan as the formal public input into the document. The new blueprint placed 17 anchor projects and use-oriented precincts within the central city. Much of the final plan was consistent with the council's draft plan—a compact central core of low-rise buildings and an expanded river park system—but there were some important differences. Some key recovery projects, such as the convention center, the metropolitan sports

facility, the children's playground, the earthquake memorial, the swimming pool, and the central library, were still included, but their location, size, or both had shifted. Other new projects emerged, such as the performing-arts precinct, the justice and emergency services precinct, the innovation precinct, and a new stadium. Most notable, however, was the reduction in the size of the city's central core to only 40 hectares (100 acres), to be framed to the south and east by 12 city blocks of open space and low-density residential and campus-style office development.

The blueprint lacked much information on transport, and the replacement chapter on transport, *An Accessible City*, was approved in October 2013 (CERA 2013a). The planning process for the chapter lasted more than a year and included a nearly three-month public comment period. The new plan did not include the council's directives to explore light rail. A residential chapter, *A Liveable City,* was also developed in 2014 and approved by the minister for CER in January 2015 (CERA 2015b). It creates a



The locations of proposed precincts and anchor projects are laid out in the Christchurch Central Recovery Plan of July, 2012. *Source*: CCDU (2012).

new central-city residential zone and, counter to the strong consensus among public comments, including the Christchurch City Council's, amends residential provisions of the Christchurch City Council's district plan with the aim of removing "unduly and unnecessarily complex planning" and "providing for more flexibility in the way that a range of housing types can be designed and built in the inner city" (CERA 2015b, 16).

The CCDU led the plan's implementation, which has involved land acquisition, demolitions and site clearance, decisions on development proposals, reconstruction management, and funding. CERA's first use of the compulsory acquisition powers of the CER Act came on October 2, 2013, when the CCDU set about acquiring land needed for the anchor projects (Murdoch 2014). Although credit has been given to CERA and the CCDU for accelerating design and implementation of the CBD rebuild, there has also been criticism that the central city blueprint and elements of its regulatory framework have been overly cumbersome and impeded redevelopment (McCrone 2014). There were repeated calls, especially from the business sector, for CERA to revamp the CCDU to function more as a public-private development partnership than as a government department and to hire professionals with international commercial development experience.

In May 2014, CERA and MBIE released the first comprehensive *Public Sector Rebuild Programme of Work*, which set out the estimated project costs, timing, sequencing, and responsibilities across CERA, the Christchurch City Council, and other agencies for the anchor projects, infrastructure, and other public facilities. The June 2015 version extended the construction time beyond 2021 (CERA 2015d). In January 2015, it was revealed that the national government had scaled back its land purchase program by nearly 25 percent, citing increasing land prices as a major cause (Stylianou 2015). This further frustrated landowners who were unclear whether their land would be purchased or they would be allowed to retain their sites. In May 2015, the CCDU announced that the completion dates for some of the anchor projects would be later than originally estimated. The new bus interchange opened in May 2015, and rebuilding in the retail, innovation, and justice and emergency services precincts has progressed well over 2015 and 2016. However, other projects, such as the earthquake memorial

and the convention center, were delayed; some projects, such as the metro sports facility, will be delayed several years.

The Regional *Land Use Recovery Plan*

In October 2011, Minister Brownlee used legal authority granted to him under the CER Act to introduce a new chapter into ECan's 1998 Regional Policy Statement that, among other items, would effectively alter the region's development plan to provide more land for post-earthquake housing and rebuilding (Chisolm 2012). Some of the region's largest landowners challenged his action, and in December 2012, the New Zealand Court of Appeal upheld lower-court rulings against the minister, stating that his use of powers under the act directed toward recovery and planning matters must be addressed by way of the *Recovery Strategy for Greater Christchurch* or a recovery plan, both of which had community-participation requirements (New Zealand Court of Appeal 2012).

Subsequently, Minister Brownlee directed ECan to develop a land use recovery plan for greater Christchurch to respond to the impacts of the earthquakes on residential and business land use in the region. The finalized *Land Use Recovery Plan*, which took effect in December 2013, contains policies and recommendations to provide for an anticipated 40,000 new households in both greenfield and existing urban areas across the region (CERA 2013b). The plan explicitly excludes the liquefaction red zones and the CBD, which is covered by the *Christchurch Central Recovery Plan*. It effectively achieves the minister's original objective to release land for development and directs the local and regional councils to amend the regional policy statement, district plans, and other regulatory instruments to help implement the policies and give effect to the *Land Use Recovery Plan*. ECan, in collaboration with strategic partners, developed the Land Use Recovery Plan Monitoring Report, which tracks the implementation of plan actions and the overall impacts and outcomes of the planning policies, such as housing policies.

By December 2014, nearly three-quarters (28,500) of the potential 40,000 new residential sections in greenfield areas in greater Christchurch

Unlike the high-rise structures formerly permitted in Christchurch CBD, lower-rise, compact buildings dominate the area in accordance with the height limit put in place by the city's "Share an Idea" post-earthquake recovery planning effort.

had been rezoned. Much of the new housing construction is located in suburbs north and west of central Christchurch. This has changed school, work, and leisure patterns for many resettled households (NZ HRC 2013). In late 2014, about 3,000 fewer households lived in the Christchurch area than before the earthquake, and reconstruction was not expected to meet demand until 2017 or 2018 (CERA 2014a).

LESSONS

A critical aspect of the Canterbury recovery was the leading role of the national government, which bears responsibility both for financing much of the residential reconstruction and insuring properties against future disasters. It investigated land damage and developed a comprehensive strategy for addressing ground failure issues and reducing uncertainties for insurers and property owners. Since the 2010–2011 earthquakes, its role has also encompassed broader governance, housing, land development, social, and economic issues in the Canterbury region.

Disaster recovery in New Zealand presents two issues that provide lessons for other recovery processes. The first is the relative roles of local and national governments in financing and directing reconstruction. The second concerns decisions to rebuild or abandon ground failure areas and the complicated processes needed to ensure an equitable and effective process. The future of the heavily damaged Christchurch CBD is a third issue, but it is still too early to assess the result.

Governance

The suite of nationally adopted legislation and cabinet-level decisions in response to the Canterbury earthquakes aimed to improve the timeliness and effectiveness of decision making and to reduce uncertainty for residents, businesses, insurers, and other stakeholders in the recovery. There is strong evidence that both these goals are being achieved for some stakeholders; however, there are many examples where they are not.

The recovery legislation and the resulting decisions centralized recovery authority and operations, as well as land use policy making, at the national level. Governance, planning, and policy making transformed from a locally led collaborative approach to one in which local governments merely support the policy direction of national agencies with, in some cases, little or no involvement in key decisions or their implementation.

Because the Canterbury region is still in the midst of its recovery, and even the most optimistic estimates project that complete rebuilding will take several more years, it is not yet possible to fully assess the strengths, weaknesses, and outcomes of these policies. An early analysis shows signs that the centralization may have helped strengthen coordination among national agencies, expedite the policy- and decision-making processes, and ensure accountability for the considerable public expenditures, but it may have been less effective at facilitating coordination among multiple levels of government, building capacity at the local and regional levels, and promoting collaboration and empowerment among government agencies and with the private sector (Johnson and Mamula-Seadon 2014). Experience has shown that the complexities of large-scale disaster recovery require local

innovation and localized and long-term capacity building among the ultimate stakeholders—the affected local authorities, residents, and businesses.

The centralization of governance in the Canterbury region may have been necessary because the repeated earthquakes and the scale of the disaster losses, as well as the uncertainty of future risks, simply overwhelmed the capacity of local governments. Also, it is important to remember that local-government capacity is already quite constrained in New Zealand, even in nondisaster times; through the Local Government Act and other regulations, the national government maintains tight control over local authorities. Furthermore, in a small country of fewer than 5 million people, the democratically elected national government is still quite locally connected. As CERA's former chief executive stated, "Democracy has not been relegated away here. . . . Christchurch needed to be reborn and it needed to be done immediately. Democracy gave us that opportunity and we took it with both hands so that the very people who chose the government to govern would be best served" (Sutton 2014, 55).

The model of dual governance established by the CER Act may have been flawed in that it did not clearly distinguish the roles of the national and local governments and aggravated preexisting tensions and conflicting institutional cultures and political paradigms within them (Murdoch 2014; J. Smith 2014). The CER Act "establishes a minister with exceptional powers and a new ministry. . . . However it leaves the mandate of local authorities largely unchanged, and while the Minister clearly has the final say on the matters outlined in the CER Act, neither he nor CERA have any direct line of management or control over the local councils" (J. Smith 2014, 147).

Without direct involvement in the design and implementation of much of the region's recovery policy, local authorities in the Canterbury region may lack the necessary expertise and capacity to assume the leadership and operational reins for recovery as the national government's involvement decreases. In her June 2015 proposal to address the city's financial crisis, Mayor Dalziel said: "Next year the Canterbury Earthquake Recovery Act expires, and I want the city to be positioned to take full responsibility for leading the next phase of the recovery. . . . Coming to

terms with what has been lost has been very hard, but just as hard has been the sense of having no control over decisions that are being made for us. The number of [public comments] that focused on projects the council wasn't responsible for was pretty overwhelming. But it highlighted the desire to have a real say about the city we are to become. We need to be in a position to step up and take that leadership role once more" (Dalziel 2015).

The national government's transition recovery plan, released in October 2015, outlines a more shared governance structure to replace CERA but still maintains national-level recovery oversight and the ministerial oversight for at least another five years, until 2021. In April 2016, Parliament approved the formation of a new joint Crown–Christchurch City Council entity called Regenerate Christchurch to oversee the long-term development and enhancement of the central city, Christchurch's residential red zone, and Christchurch's eastern suburb of New Brighton (New Zealand Parliament 2016). Regenerate Christchurch has an independent board; Minister Brownlee appoints the chairperson until 2019, and the Christchurch City Council will appoint the chairperson from 2019 until 2021. In 2021, Regenerate Christchurch will become an organization fully controlled, owned, and funded by the council. A new Crown company, Otakaro Limited, has also been formed. It is responsible for the completion and management of the anchor projects and the future divestment of Crown-owned land. The Department of Prime Minister and Cabinet is responsible for monitoring progress in Christchurch.

The legislation and policies in response to the Canterbury earthquakes are affecting local governance and natural-hazard risk management across the country. Since 2010, the national government has undertaken reviews or introduced reforms of all the key pieces of legislation constituting the country's natural-hazard risk management framework, citing the need to strengthen the national government's role, standardize and streamline policies, curb perceived bureaucracy, and shorten decision-making processes. Scholars, public interest groups, and citizens at large have expressed concerns about the retreat from decentralized and collaborative governance approaches and the potential lasting implications for local government, representative democracy, and the rule of law.

Policies for Hazardous Areas

Areas that experienced earthquake liquefaction, ground settlement, and rockfall hazards posed difficult dilemmas for the national government in its roles as insurer of private property, provider of infrastructure, and promoter of the public interest via policies for land use and economic development. The costs of remediating the land—including stabilizing and reshaping the earth, reconstructing infrastructure, and paying for housing reconstruction—had to be balanced against the direct costs and socioeconomic impacts of relocation, as well as the uncertain costs of potential future damages and reinsurance costs.

There are few situations comparable to the New Zealand land damage experience. As EQC geotechnical engineers noted, "No city has been liquefied four times before; . . . it really is unparalleled" (Williams 2011). The EQC's unique obligation to fund land damage repairs stimulated the major area-wide geotechnical studies that should serve as a best-practice model for future post-disaster geotechnical hazard investigations. The national government's land zoning categories and its associated policies were developed quickly, within nine months of the first earthquake and just four months after the more severe February 2011 earthquake, and were based on considerable scientific information. Minister Brownlee later recounted, "A huge amount of geo-technical science had identified significant differences in Christchurch's soils and their propensity to liquefy in the event of major earthquakes. It would have been irresponsible not to provide guidance to how that science should be responded to" (Brownlee 2013).

The national government's red zone voluntary buyout offers reduced uncertainty and future risks for residents, provided options for residents to sell and relocate, and reduced financial risks to the government and insurers both in the present and for the future. Also, removal of the most vulnerable properties from residential occupancy reduced the risk profiles of insurance portfolios, as well as those of local councils and private utilities that serviced these areas.

The technical categories for foundation engineering requirements also helped reduce uncertainty for the vast majority of green zone properties that were in technical categories 1 and 2. According to the Department of

Building and Housing, "It means that 80% of [residential] properties can get on with their repairs without needing detailed geotechnical investigations. It also means from a time scale we won't have years potentially of further delay while unnecessary geotechnical investigation and design is undertaken" (NZ DBH 2012). Ensuring that homes are repaired or rebuilt safely, given their underlying soil conditions, improves the region's building stock, which could help protect equity and future property values.

Although the future risk of hazards has been significantly reduced for New Zealand's government and residents, some new risks and uncertainties resulted from these policy actions that, in many instances, are causing an array of ripple effects across the region and will take more time to fully assess. They do, however, provide cautionary notes for hazard-related land use policy design and implementation.

The widespread damage to the region's residential building stock caused immediate shortages of both rental and for-sale housing. Displaced residents and recovery workers have driven the demand for both temporary and new permanent housing. Matters only worsened over the first five years of recovery as both rental and for-sale housing costs rose by more than 30 percent on average (*QV.co.nz* 2016).

Increased housing costs, coupled with lengthy insurance settlements and difficult foundation engineering requirements, meant that many residents did not experience the certainty that the national government's land zoning decision had intended to provide. Those residential property owners who accepted option 1 (to sell both their land and homes) early in the buyout process likely had the most certainty and confidence to move forward with their lives because they did not need to wait for wide-scale land remediation projects to be completed, the national government assumed responsibility for settlement of the building damage claims with the EQC and private insurers, and they were more likely to find alternative housing before the supply tightened. Red zone property owners who selected option 2 maintained responsibility for settling the building damage portion of their insurance claims with the EQC and private insurers, which has been an extremely complicated and lengthy process in some cases. Thus, for many red zone owners, comparable replacement properties were nonexistent or cost far more than their purchase offers and insurance

settlements. Similarly, those properties in technical category 3 (TC3) areas with heightened foundation engineering requirements have also likely had a much slower recovery, riddled with more uncertainty for residents and insurers, as builders and the geotechnical community worked to develop new solutions for lighter-weight dwellings and appropriate foundations.

Exacerbating the problem, affordable rental housing or government-owned, social housing constituted a high proportion of the lost housing units, and these households have found it particularly difficult to find affordable housing (NZ HRC 2013). Homelessness rose, and reconstruction of the social housing stock, hard hit by the earthquakes, has been slow. Concerns persist that more government intervention is needed to provide low-cost financing to private developers and to construct more social housing.

Many stakeholders have also expressed concerns about the lack of information and public participation in policy development and decision making throughout the recovery. With respect to the hazard-based land zoning decisions, the national government did not consult residents and property owners, or even local elected officials, about the policy design, the value and terms of the buyout offers, settlement dates, and risk tolerance levels, as well as other potential implications, such as local school closures. Repeated requests to release detailed geotechnical information that formed the basis of the land zoning decisions were denied for over a year until much of the zoning was complete in September 2012. The New Zealand Human Rights Commission charged that the social implications of these decisions "have been especially acute for those who were already disadvantaged or facing discrimination in the pre-disaster context, such as people with disabilities, the elderly, cultural minorities, and children and young people" (NZ HRC 2013, 10).

In the two major legal challenges to the national government's land use policies—by property owners in the red zone[13] and by landowners challenging the minister's efforts to make more land available for post-earthquake housing and rebuilding[14]—the courts determined that the CER Act called for recovery and land use planning matters to be addressed by a recovery planning process that involved community participation. A participatory planning process for the national government's land zoning decisions would

likely have uncovered many of the consequential issues that required supplemental policies, programs, and actions, including buyout offers for uninsured residential and nonresidential properties inside the red zone, the provision of advisory services to assist homeowners with insurance settlements and repair and rebuilding solutions, the need to address housing supply and affordability simultaneously, security and maintenance of the red zone lands, and determination of the future use of the red zone lands. As noted in CERA's third annual review in late 2014, the organization needed to complete an organizational transition from "reactive response" to "proactive and planned recovery" (Murdoch 2014, 14). More consultations would likely have raised additional issues that are still not being fully addressed in policy, particularly the blight and economic decline of areas adjoining the red zone and TC3 properties, shifts in population and impacts on local council revenues and infrastructure demands, and implications of decentralization and sprawl for the region as a whole.

The Central City and Other Land Use Issues

The national government's planning strategy for the Christchurch CBD has been to invest in projects that can catalyze private investments. Although some of the anchor projects are completed or well under way, a few that many investors see as central to their reinvestment, such as the convention center, are behind schedule, and cost projections have increased. An investor confidence survey conducted in late 2014 found that investor optimism about the Canterbury region had dropped from 30 percent to 9 percent in the previous year (McClure 2015). However, the completion of a number of new office buildings, starting in late 2015, is expected to bring an influx of up to 8,000 office workers over the next two years and subsequent, positive ripple effects for retailers, restaurants, and even housing (McDonald 2015).

Former CBD businesses that were displaced must compare space configurations and rental rates in their relocation area and a newly constructed CBD. Some businesses have done well in their new locations and may prefer to stay. Conversely, other businesses may not survive the moves and

business interruption. The national government has helped by moving thousands of staff in about 20 government departments and agencies back into the central city. The chief executive of the region's chamber of commerce, Peter Townsend, stated, "That threat of a doughnut city with a wasteland in the middle has gone. It's all starting to come together" (McDonald 2015).

Both the earthquakes and the subsequent planning decision caused major changes in the function and regional role of the CBD, and it will take some time to see how the post-earthquake CBD evolves. The future governance and management arrangements of the central-city rebuild were a central focus of the national government's recovery transition plan (CERA 2015a). Many maintained that the overall management model of the CBD rebuild was flawed, and that a commercial operation at arm's length from both the national and city government was required (Murdoch 2014). The Christchurch City Council responded in April 2015 by unanimously approving plans to establish Development Christchurch, a development authority that is governed by an independent, commercially focused board under Christchurch City Holdings Limited, the council's commercial arm. The development authority's focus extends beyond the CBD to help implement the city's suburban master plans, as well as key anchor projects.

As previously noted, this analysis is incomplete because the Canterbury recovery process is still at an early stage, and the final land use outcomes have not yet been determined. Full assessment of the recovery impacts and outcomes in the Canterbury region and the country will take many more years.

NOTES

1. Over the past six years, Laurie Johnson has had research and consulting engagements with the Joint Centre for Disaster Research at Massey University, the Christchurch City Council, the Waimakariri District Council, and the Canterbury Earthquake Recovery Authority.
2. In this chapter, the currency conversion rate is 1 New Zealand dollar (NZ$) = 0.8 U.S. dollars (US$).
3. The EQC residential insurance covers the cost to repair land damage, or the value of the land, that is underneath or within 8 meters (26 feet) of the insured home and outbuildings and under the main access way to the home. It may also pro-

vide some coverage for bridges, culverts, and retaining walls that are necessary to support the home, outbuildings, or insured land.

4. Roger Sutton was the chief executive of Orion New Zealand Limited, a local power company, before joining the CERA. Orion's work to restore service quickly after the September 2010 earthquake and to make system enhancements that proved to be effective in restoring power quickly after the February 2011 earthquake gained praise. After New Zealand's State Services Commission found Sutton guilty of serious misconduct charges, he resigned from CERA in November 2014.
5. The national government's intervention and appointment of commissioners have been colloquially termed "E-canned." In the aftermath of the earthquakes, other local-government officials expressed fears that they too would be E-canned by the national government.
6. Bob Parker was elected to his first term as Christchurch's mayor in 2007 and was facing a serious challenge for reelection in 2010 when the September 4 earthquake struck. In December 2013, he received a Knights Companion of the New Zealand Order of Merit specifically recognizing his 22-year career in local government and his leadership after the 2010–2011 earthquakes.
7. The IANZ is the agency charged with granting building consent authority to local and regional councils. A routine assessment by the IANZ in 2009 raised a number of requests for corrective action, but follow-up assessments in 2010 and 2011 were canceled or postponed because of the earthquakes. The September 2012 assessment raised even more requests for corrective action, which the council did not address before the IANZ's follow-up assessment in May 2013.
8. David Ayers served as a local councilor in the Waimakariri District for more than 20 years before running for district mayor in 2010.
9. The maximum amount includes CERA funding for 60 percent of costs for water infrastructure repairs and NZTA funding for 83 percent of road infrastructure repairs.
10. Local authorities are required to update property rating valuations at least every three years. The 2007 rating valuation was chosen for properties in the city of Christchurch because it was the most current valuation as of September 3, 2010, the day before the first earthquake (New Zealand Cabinet 2011). The 2008 rating valuation was used for properties in the Waimakariri District because this was its latest valuation on September 3, 2010.
11. A similar review process was established for the Port Hills zoning in October 2012 and completed in December 2013. The review added 237 properties to the Port Hills red zone for a total of 714 properties; additionally, 33 properties were rezoned from the red to the green zone. Eligible red zone property owners in the Port Hills were also granted an extension until August 31, 2014, to decide whether to accept a government purchase option.
12. "Share an Idea" was the unanimous overall winner of the Netherlands-based Co-creation Association's 2011 awards, which recognize and celebrate the most original and successful cocreation initiatives. It was the first time that an initiative outside Europe was given the award.

13. *Quake Outcasts and Fowler Developments Ltd vs. the Minister CER and the Chief Executive of CERA* (Supreme Court 5/2014 and Supreme Court 8/2014) (New Zealand Supreme Court 2015).
14. *Canterbury Regional Council vs. Independent Fisheries Limited and Others* (Court of Appeal 438/2012) (New Zealand Court of Appeal 2012).

4 Japan

National Land Use Regulations Drive Recovery

Throughout its history, Japan has struggled and prevailed against a host of natural and human-made calamities. Traditionally, the government has been responsible for restoring urban infrastructure and the physical environment to their pre-disaster states, but rebuilding private property has been considered an inappropriate use of public funds. When unprecedented devastation hit the city of Kobe and the Kansai region in 1995, restoration to a pre-disaster state was not possible. Governmental policy and financial engagement needed to go beyond physical recovery and address economic and social recovery, as well as reconstruction to a new post-disaster state; this was a new challenge for local and national leaders and disaster managers alike. When a magnitude 9.0 earthquake struck the Pacific coast of northeastern Honshu in the Tohoku region of Japan on March 11, 2011, a new generation of political leaders and managers at all levels of government again faced unprecedented levels of destruction that required broader intervention and adaptive reconstruction strategies. This chapter examines the governance models established after both the 1995 and 2011 disasters. In addition to secondary sources, it is based on research conducted by the authors over two decades since the 1995 earthquake.[1]

In Japan, political power is vested in the national government, which oversees prefectures, cities, and other local governments. Prefectures function both as intermediaries between the national government and most cities

within their boundaries and as local governments for areas where cities do not exist. Under the Local Autonomy Law, the national government delegates authority to Japan's local governments for general policing, social security and welfare, urban infrastructure construction and maintenance, urban planning, education, and tax levying and collection. The prefectures generally oversee the functioning of local governments. A few of Japan's largest cities, including Kobe and Sendai, are semiautonomous and thus have authority from the national government to act independently of the prefectures in governing within their wards. Nonetheless, the national government plays a strong role in local affairs of all prefectures and cities through its oversight, setting of national standards, and control over finances.

JAPAN'S CITY PLANNING AND BUILDING REGULATIONS

National legislation governs local planning and building activities. The most prominent laws are the City Planning Law, the Building Standards Law, and the District Planning amendments to these two laws. The City Planning Law provides for local adoption and updates of long-range master plans, subject to the approval of the prefecture and the national government, and establishes the basic ground rules for planning and zoning in local jurisdictions under the general oversight of the prefectures and the Ministry of Land, Infrastructure, Transport, and Tourism (MLIT). Although the law grants planning authority to local governments, large planning actions require approval from the national government.

The Building Standards Law establishes nationwide minimum standards for building construction linked to the national land use categories under the City Planning Law. A municipality or prefecture uses building confirmations to ensure that building applications are in compliance with the Building Standards Law. If an application complies with the use, density, height, and related standards, it must be approved by right. The Building Standards Law includes a provision that private engineers certify that construction is in regulatory compliance with the codes. In contrast to the United States, where local governments adopt and administer all building

regulations, Japanese local governments do not play a direct role in code enforcement. District planning is one of the few ways in which local governments can modify national regulations and exercise more localized control over the physical planning and urban design of private property in regard to such matters as height, floor area ratio, and setbacks. Other important planning functions include redevelopment and land readjustment, through which cities can rebuild older areas by rearranging land parcels and reconstructing buildings.

The Urban Redevelopment Law allows for consolidation of all land and building rights within a designated area, construction of new buildings and public facilities, and transfer of the preexisting property rights to the new buildings. This process typically involves mixed-use commercial and residential development, road widening, and parks, and rights holders may be bought out or end up in different locations and structures than before. Redevelopment is financed primarily through the sale of reserve floor area (floor space exceeding that needed for existing rights holders). In addition, the national government provides a subsidy for land preparation and common spaces, and managers of public facilities (such as roads) contribute funds.

Land readjustment is one of the primary tools of urban planners in Japan and has been carried out in approximately 30 percent of the nation's urbanized area (Japan Ministry of Construction, City Bureau 2000). This complex, multistep process involves modification of property boundaries for future road-widening projects, open spaces, and other public facilities.[2] Under the Land Readjustment Law, property owners share equally in the costs of public facilities by means of their contributions of land. The law's original purpose was to consolidate agricultural land parcels to create usable roads and parks for urban development. Although land readjustment does not require land purchase, funding is necessary to purchase existing buildings, administer the replotting, prepare the site, and construct the public facilities. The primary revenue source for land readjustment is the sale of reserve land, supplemented by government subsidies.

Under land readjustment, each landowner loses some land area, but the new infrastructure and improved accessibility add value to each parcel.

Land readjustment benefits the national government by eliminating the need to buy land for new roadways, open space, and public facilities. It has also been used for urban renewal in existing built areas and vacant industrial sites and for improvement of road networks. Land readjustment may require demolition of existing buildings; in that case, owners are compensated for the loss so they can rebuild on their new parcel.

The roles of citizens and local governments in the planning process have been increasing over the past three decades. Sorensen (2002) dates the beginning of *machizukuri* (community-based planning) to the passage of the 1968 City Planning Law, which granted authority to local governments to issue development permits for large-scale projects. Thereafter, many local governments adopted higher development standards and controls than those specified in the national city planning and building laws, as well as ordinances that outlined the process for gaining public input into development decisions, referred to as *machizukuri* ordinances.

THE LEGACY OF THE 1923 TOKYO EARTHQUAKE

Although many of the laws guiding modern planning and building construction postdate World War II and Japan's great economic boom of the 1960s and1970s, their origins stem from the early 20th century and the introduction and centralization of government and planning authority in the early 1900s. Under the leadership of Japan's Home Ministry,[3] the national government began using city planning to promote economic growth and build major roads and railways, especially in the country's two major metropolitan areas: Tokyo, with over 4 million people by the mid-1920s, and Osaka, with over 2 million people by that time (Sorensen 2002; Tokyo Metropolitan Office 1933).

The Great Kanto Earthquake of September 1, 1923, and the subsequent tsunami and fires were Japan's first modern urban catastrophe. All total, 140,000 people died or were listed as missing, much of central Tokyo and Yokohama—Japan's biggest port and designated gateway for Western commerce at the time—were destroyed, and more than half a million families were displaced (Tokyo Metropolitan Office 1933).

In swift response to the catastrophe, Japan's national government, for the first time in modern history, assumed a major leadership role in planning, financing, and implementing post-disaster rebuilding in Tokyo and Yokohama. The disaster was also a pivotal moment for the burgeoning field of city planning, which was central to the government's recovery policy and approach. The day after the earthquake, Goto Shinpei—Tokyo's mayor from 1920 to 1922 and the former national home minister who had led the development of much of the country's city planning policy—was reappointed to the post of home minister and then was named president of the Imperial Capital Reconstruction Board on September 19, 1923 (Tokyo Metropolitan Office 1933). Minister Goto and the board set forth an ambitious plan to ensure that Tokyo remained the nation's capital. Their work employed advanced Western planning techniques and exercised strong controls over the independent rebuilding activities of landowners so that a more rational road network in the central city could be constructed (Watanabe 1984). The Reconstruction Board drafted the Ad Hoc Town Planning Act, which was enacted in December 1923 and came into effect in March 1924 (Sorensen 2002). The act established land readjustment as the main approach for reconstruction and significantly modified procedures so that the government could initiate projects without first gaining the consent of private landowners.

In February 1924, the Reconstruction Bureau was established in the Home Department and was charged with the planning and execution of Tokyo's reconstruction, including the land readjustment process, the reconstruction of various government buildings, and the construction of roads, schools, and other public infrastructure (Tokyo Metropolitan Office 1933). It also controlled the funding provided by the national government for the reconstruction. The head of that bureau, the reconstruction minister, reported to the prime minister, and staff from various national-government ministries were seconded to the bureau to work under the direction of the reconstruction minister (Okamoto 2014).

In all, 3,000 of the 3,636 hectares (about 7,400 of 9,000 acres) of destroyed land in Tokyo were divided into 65 land readjustment projects; the national government officially managed 15 projects, and the Tokyo

Municipal Government led 50 projects (Tokyo Metropolitan Office 1933). The devastated area was redesigned to have a five-layer road hierarchy and to be rebuilt in phases over seven and one-half years (Sorensen 2002). During that time, more than 6,000 people worked for the Reconstruction Bureau, and many later staffed local city planning commissions set up by the Home Ministry across the country (Sorensen 2002). Also, a foundation, Dōjankai, was established to construct public housing and provide work for earthquake victims, using ¥10 million of the nearly ¥60 million raised by donations from across Japan and the world (Sorensen 2002).[4]

Reconstruction after the Great Kanto Earthquake had some enduring legacies for city planning and disaster recovery policy in Japan. First, it established land readjustment as a planning tool that both the national and local governments could use proactively in urban renewal without having to wait for private landowners to initiate the process. Second, a precedent of centralization of governance and demotion of local-government and individual rights for the sake of expediency in post-disaster rebuilding was established, and the legend of Minister Goto and Reconstruction Bureau endured to the time of later disasters. Third, in the rush to rebuild, the building code was suspended, and much of central Tokyo was rebuilt with flammable wooden buildings, while a massive wave of suburban growth around Tokyo occurred simultaneously and haphazardly, with little planning intervention; both of these factors have contributed to the considerable risk of conflagration that endures today (Nakabayashi 2006).

JAPAN'S DISASTER MANAGEMENT FRAMEWORK

Like that of many other countries, Japan's disaster management framework has developed incrementally over time, largely in response to specific disasters and the particular issues arising from them. Modern disaster management began to take shape in the 1960s after the Ise-wan typhoon struck central Honshu in 1959, killing over 5,000 people, and a magnitude 7.5 earthquake heavily damaged the city of Niigata in 1964 despite its modern construction and advanced urban planning approaches.

The Disaster Countermeasures Basic Act defines the basic disaster management roles and responsibilities of each level of government. A deter-

mination of disaster severity clarifies which levels of government are responsible for post-disaster management, including emergency response and recovery. Small-scale disasters are the responsibility of local governments. When multiple local governments suffer damage, the prefecture gets involved. When a large-scale or multiprefecture disaster occurs, the national government gets involved.

The act also calls for the establishment of a Central Disaster Prevention Council and local (prefectural and municipal) disaster-prevention councils. The Central Disaster Prevention Council resides within the Cabinet Office, is chaired by the prime minister, and includes the entire cabinet, heads of major public institutions, and experts. It is responsible for the formulation and implementation of the national disaster management plan, as well as policies and plans for emergency measures for a major disaster involving the national government. Local disaster-prevention councils are responsible for developing operation plans and establishing headquarters for disaster control to execute emergency response. The governor of the prefecture or the mayor of the city or town chairs these headquarters.

Japan's Disaster Relief Act, the primary disaster response law, emphasizes initial relief for disaster victims. In doing so, it requires an initial disaster declaration that includes a determination of a disaster area. It also establishes a series of relief milestones that must be achieved after a disaster, such as the establishment of emergency shelters and temporary housing. The national government then provides subsidies to local and prefectural governments for essential local response and recovery actions, such as evacuation centers, temporary housing, public infrastructure and facilities, and replacement of public housing. The percentage of national-government support increases with the severity of the disaster.

Japan has one of the oldest residential earthquake insurance systems in the world. The Japan Earthquake Reinsurance Company was founded in 1966 after the devastating 1964 Niigata earthquake and is backed by the national government. The system provides a limited earthquake endorsement to a homeowner's basic fire policy. Insurance payments are typically limited to about 30 to 50 percent of the structure's full replacement value and a maximum of ¥50 million (US$410,000) for a building and ¥10 million

(US$82,000) for personal property (JER 2016). Residential earthquake insurance coverage has traditionally been low, but the rate has been steadily rising and in 2016 exceeded 30 percent in some of the highest-risk parts of the country (JER 2016).

THE 1995 HANSHIN-AWAJI EARTHQUAKE

The magnitude 6.9 Hanshin-Awaji earthquake struck at 5:46 a.m. on Tuesday, January 17, 1995, on the shallow, relatively unknown Nojima fault at the north end of Awaji Island in Osaka Bay. It was a devastating surprise for Japan. The strongest ground motions were felt in the downtown district of Sannomiya in the city of Kobe (population 1.5 million) and the heavily urbanized flatlands that lie between Osaka Bay and the Rokko Mountains in the southern part of Hyogo Prefecture (population 5.5 million) (Edgington 2010). All urban lifeline and transportation systems, including Japan's high-speed Shinkansen (rapid rail) system, pass through this densely developed strip. Widespread liquefaction occurred at the Port of Kobe and elsewhere around the margins of Osaka Bay.

Losses from the earthquake were immense. In all, over 6,400 people were killed, and 40,000 were injured (Hyogo Prefecture 1999a). Nearly 60 percent of those who died were women, and more than half were persons age 60 or older (UNCRD 1995). Fires consumed 82 hectares (203 acres) of urban land, and more than 400,000 buildings were damaged, of which 100,000 collapsed completely (Hyogo Prefecture 1999a). About as many were partially damaged, and thousands more sustained minor damage.

The destruction was concentrated in a swath of older, densely developed neighborhoods approximately 3 km (1.8 miles) wide and 30 km (18 miles) long (City of Kobe 2012). Many of these neighborhoods had old wooden houses and buildings that had been constructed in the massive rebuilding period after World War II but before the 1981 update of seismic safety standards in the national Building Standards Law. Mixed land use, a high proportion of small lots, and insufficient roads and open space also characterized these areas. The inner-city neighborhoods, however, afforded a convenient place to live and work, and even elderly residents could live on

Fires blaze in Kobe on the morning of the January 17, 1995, earthquake. Photo by Kobayashi Ikuo (1995). Reprinted with permission.

This is a view of the same neighborhoods of Kobe 22 years later. Photo by Hosono Akira (2017). Reprinted with permission.

their own with the support of the community. As a result, the proportion of older and low-income tenant victims was relatively high in this area.

Nearly 450,000 housing units were either partially or completely destroyed (Hyogo Prefecture 1999a). About 400,000 people in the region were left at least temporarily homeless, and over 316,000 people sought public shelter (Tomioka 1997). Thousands of households relocated to the homes of friends and family members, rental housing in distant locations, or temporary housing. Over 48,300 temporary housing units were constructed by August 1995, and another 14,000 public housing units were used temporarily to house victims of the disaster; most of the temporary housing units were placed on publicly owned vacant land, generally outside familiar neighborhoods (Olshansky, Johnson, and Topping 2006). The temporary housing was planned for two years of occupancy, but over 5,000 temporary units were still occupied four years after the earthquake (Hyogo Prefecture 1999a).

Most of the region's schools, many hospitals, the older portion of Kobe's city hall, and other major public facilities sustained heavy damage. Damage to water, gas, and sewer systems was widespread. One million households initially lost power, and restoration took about six days. More than 845,000 households lost gas service for over two months, and the restoration of water and wastewater systems to nearly 1.27 million households took up to three months in some parts of the region (Hyogo Prefecture 1999a).

Extensive rail and roadway damage included the collapse of significant portions of three major east-west freeway routes through the region, damage to the Japan Rail Sanyo and Shinkansen lines and stations, and the collapse of Kobe's subway and stations. Reconstruction of rail lines and roads was given priority but still took many months or even years to complete. Transportation in the region was severely impeded for most of 1995, and some areas continued to have reduced accessibility until late 1996.

Almost all container berths in the Port of Kobe, Japan's leading container shipping port at the time, sustained heavy damage, and its highway access was disrupted. Repair of the port took almost a year. During this time, port disruption was estimated to cost an amount equivalent to the income of 40,000 workers (Chang 2001).

Chemical and steel plants in the Hanshin industrial zone were rendered inoperable for several months, and the shoe industry centered in western Kobe was severely affected. About half of the region's famous sake breweries were seriously damaged, and one-third of the shopping districts and half of the neighborhood markets were affected (City of Kobe 2012). After the earthquake, unemployment rates rose quickly, and 80 percent of the city's 2,000 small and medium-sized businesses failed (City of Kobe 2012).

In January 1995, Japan and the Kansai region were in the midst of an economic recession that had begun in the early 1990s, creating substantially lower land prices and higher commercial vacancy rates than had previously existed. Kobe's economy was in transition from heavy industry to technology, medical, service, and retail sectors. Kobe's heavily damaged central core had been losing affluent population and jobs to new suburbs, and these trends accelerated after the earthquake. The port had also been declining because of competition from other Asian ports. The total loss of transport infrastructure, the port closure, manufacturing shutdowns, and other business and institutional impacts diverted substantial sales, employment, and investment to competing regions in Japan and elsewhere.

Insurance losses to domestic carriers were about ¥300 billion (US$3 billion), and the cost to the international insurance market for claims arising from additional shipping costs, business interruption, and inventory losses was similar (OECD 2004).[5] Japan's national government paid over ¥78 billion (US$780 million) in residential earthquake insurance claims (Marine and Fire Association of Japan 2002).[6] Most residents relied on personal savings and available public assistance to fund repairs and rebuilding.

ORGANIZING FOR RECOVERY

Recovery from the 1995 earthquake required considerable involvement of the national, prefectural, and local levels of government. Many volunteer groups that performed a variety of relief activities in the first months after the earthquake remained active into the recovery and, in many cases, grew

into community action groups that promoted long-term recovery and reconstruction.

The National Government

The extensive damage to all forms of telecommunications delayed transmission of news of the Kobe earthquake to Tokyo and the Japanese prime minister and impeded the request from Hyogo Prefecture's governor that the national government dispatch the nation's Self-Defense Forces to assist with search and rescue, debris removal, and other emergency response and relief efforts (Mitsui 2014). Other breakdowns in national notification protocols and procedures caused additional delays and confusion and generated considerable criticism of the national government's initial response and its inability to save more human lives.

By midday, January 17, top members of the National Land Agency (NLA), which was responsible for the Central Disaster Prevention Council and national disaster management at the time, had assembled at the prime minister's office, along with the secretary of the cabinet. The secretary of the NLA at the time was Mitsui Yasuhisa, who had worked in the NLA's urban planning division since 1969 and had long relationships with planners in Kobe, including Mayor Sasayama Yukitoshi, some of the vice mayors, and others.[7] This group began considering issues of restoration and rebuilding, as well as the kind of national governance structure for recovery and the need for an advisory body for recovery (Mitsui 2014). One governance proposal was to establish a new recovery agency, akin to the Reconstruction Bureau established after the 1923 earthquake; another was to establish a recovery headquarters within the prime minister's office. Since a fast, efficient recovery was needed, the decision was made to establish a recovery headquarters instead of a new recovery agency, which would require more complex legislative action. The national Emergency Disaster Countermeasures Headquarters held its first meeting in Tokyo on January 17 and continued to meet over a three-month period after the earthquake to facilitate relief-related activities (UNCRD 1995). Various national-government ministries began dispatching investigation teams to Kobe on January 18.

On January 20, the recovery headquarters began forming in the prime minister's office. Prime Minister Murayama Tomiichi was the official head, joined by ministers of various cabinet departments that would have a funding role in the recovery. The Law on Basic Policy and Organization Concerning the Great Hanshin-Awaji Earthquake, adopted on February 24, 1995, officially installed the national Earthquake Recovery Measures Headquarters for five years (Edgington 2010). Ozato Satatoshi, director general of the Hokkaido-Okinawa Development Agency, was appointed as a special minister to lead the day-to-day operations with top staff from various ministries and agencies, such as the NLA and the Ministry of Construction, working within the headquarters to develop policies for recovery. Despite this governance arrangement, the national government's funding and execution of those policies remained within the various ministries, and the local and prefectural governments were largely responsible for implementation.

On January 25, 1995, the Cabinet Office formally declared the Kobe earthquake a "disaster of extreme severity," specifying 10 cities, including the city of Kobe, and 10 rural townships that qualified for the maximum levels of national-government assistance under the Disaster Relief Act (City of Kobe 2010). Because of the complexity of the sheltering, relief, and restoration tasks it faced, the City of Kobe asked the national government to expand the scope of assistance activities and to relax timelines under the Basic Disaster Relief Act, but the national government denied Kobe's request (Tsuruki 2004).

The cabinet officially established the national Committee for Hanshin-Awaji Reconstruction on February 15, 1995, to advise the prime minister on reconstruction priorities and funding (Mitsui 2014). Shimokobe Atsushi, an architect who had worked on the Postwar Reconstruction Board and was then the chairman of the board of directors of the Tokyo Marine Research Institute, chaired the committee, whose seven members included prominent city planning scholars, business leaders, the governor of Hyogo Prefecture, and the mayor of Kobe (Edgington 2010). Gotoda Masaharu, former director general of the National Police Agency and a prominent member of the Diet, was appointed as a special advisor to the committee (Mitsui 2014).

Near the end of February, the committee released its first report on reconstruction priorities, calling for national-government assistance for the removal of all debris and cleanup operations, construction of 30,000 temporary housing units, and immediate formulation of a 10-year reconstruction plan (Edgington 2010). According to Mitsui (2014), the national government never set up a recovery planning committee or developed a comprehensive recovery plan. Many ministries developed their own plans, but comprehensive recovery planning responsibility resided with the local governments.

Between February and October 1995, the committee met regularly (at least once a month) and submitted additional recommendations for reconstruction, including full reconstruction of Kobe's port, approaches for job creation and business recovery, and strategies for rebuilding the region's road network. Once Hyogo Prefecture and the City of Kobe had drafted their reconstruction plans, the committee reviewed the plans and offered feedback. It generally approved the overall approach, but it stressed the importance of citizen communication during reconstruction and recommended that high priority be given to improving medical care, addressing employment losses, meeting long-term needs for public housing, and enhancing transportation and communication projects to ensure better flexibility of movement in future disasters (Edgington 2010). It also cautioned that national-government funding arrangements might be less generous in the long term, which might affect a range of development projects that were planned to commence after 2000. The prime minister's participation in the committee meetings drew media attention that helped communicate deliberations to the general public more quickly (Mitsui 2014).

Taking advice from the reconstruction committee, the various ministries in the national recovery headquarters developed budgets and an array of legislation, policy, and program exceptions and changes, all designed to address the various needs arising from the earthquake. A host of opinions have been shared about the pros and cons of the national government's governance approach. Some characterized it as the most efficient approach and as consistent with the decentralization movement under way in the Japanese government at the time; others saw it as an ad hoc and incremen-

tal approach that would limit national influence and extraordinary measures (Edgington 2010; Mitsui 2014; Sorensen 2002).

The Ministry of Transportation and the Ministry of Construction, both of which are now part of MLIT, oversaw much of the government funding for the restoration projects and the rebuilding of the region's road network, port facilities, and public housing. Ministry staff worked with the City of Kobe and Hyogo Prefecture to determine the size and location of specific restoration projects. The Special Measures for Recovery of Affected Urban Areas Law, enacted on February 22, 1995, helped relax many of the national planning and building laws and facilitate the development of local recovery planning proposals for national government funding (Nakayama 2008). Most important, it broadened local controls on rebuilding under the Building Standards Law (Section 84), allowing cities to limit rebuilding (except for temporary structures) for up to two years (Edgington 2010). It also allowed for reductions in the size requirements for land readjustment projects and road widths.

The earthquake struck near the end of Japan's 1994 fiscal year on March 31, 1995. Both houses of the Diet passed a supplementary budget of ¥1.022 trillion (US$ 102 billion) on February 28, 1995, that mainly funded disaster-related rescue services of the national government and initial restoration work on roads and the Port of Kobe (Edgington 2010). The majority of recovery funding came in two supplementary budgets adopted in the 1995 fiscal year. The first, for ¥1.429 trillion (US$14.3 billion), was fast-tracked and passed on May 19, 1995, and covered shelter, waste disposal, public works, business recovery loans, and other subsidies; the second, for ¥1.5 trillion (US$15 billion), was passed on October 18, 1995, to cover government-funded construction work related to the earthquake (Edgington 2010). Additional allocations over the next two years brought the national government's funding total to more than ¥5.8 trillion (US$58 billion) to reconstruct basic infrastructure, housing, and other physical facilities (Z. Ito 2004). The quick funding is also credited with accelerating national-government approval of major projects that ordinarily would have taken up to 10 years to approve (Olshansky, Johnson, and Topping 2006).

In the initial months after the earthquake, the national government maintained its long-held position of not providing direct loans or grants to individuals. However, special financial assistance legislation was promulgated on March 1, 1995, providing short-term assistance to small businesses, homeowners, and local public authorities, including reduced local taxes, postponement of local tax collections, temporary national tax exemptions, special public works projects that hired displaced workers, and favorable lending terms for rebuilding owner-occupied earthquake-damaged housing (Kinmokusei 1999). Consolation money was provided to families of those killed or injured and to children whose parents had been killed, and the national government also provided ¥100,000 (US$1,000) each to families whose housing had been totally destroyed.

To help overcome some of the restrictions in national legislation and prevailing policy sentiment, the national government helped the City of Kobe and Hyogo Prefecture establish a special loan fund in April 1995, the Great Hanshin-Awaji Earthquake Disaster Reconstruction Fund, modeled on a smaller fund initially created after the 1993 Mt. Unzen eruption in Nagasaki Prefecture (Kinmokusei 1999). Its purpose was to provide for special activities beyond those covered by the Basic Disaster Relief Act and other national programs, such as support to victims; housing reconstruction; restoration of industry, education, and culture; and other restoration projects.

The emphasis of the fund was on rebuilding lives and facilitating a stable, comprehensive, and long term recovery (City of Kobe 2012). For example, the fund provided living support to 370,000 families and a total of ¥128 billion (US$1.28 billion) to 133,000 families whose housing was at least half destroyed and whose income was less than ¥6 million (US$60,000). Residential and commercial loans up to ¥5 million (US$50,000) were awarded to more than 30,000 businesses and households. Other programs included job-creation projects, support workers for households of elderly people, an interest subsidy to help earthquake victims rebuild or purchase homes, rent subsidies for private rental housing, interest subsidies for loans for small and medium-sized businesses and for reconstruction of private schools, projects to assist small-scale operators to reopen businesses, and

assistance with events to revive retail areas and with arts and cultural activities in damaged areas (City of Kobe 2003).

The Reconstruction Fund was established in cooperation with a private banking syndicate that provided long-term loans to the City of Kobe and Hyogo Prefecture, repayable over 10 years. The banking syndicate issued bonds to provide the loans, and the national government backed the loans and paid the interest (Tsuruki 2004). The initial total value of the loan fund was ¥600 billion (US$6 billion), which was expanded to ¥900 billion (US$9 billion) in March 1997 (City of Kobe 2003).

Hyogo Prefecture and the City of Kobe made annual interest payments to the banking syndicate, reflecting remaining balances for projects funded by the Reconstruction Fund loans. Local-government accounts showed the interest payments and portions of the costs of the construction projects as losses. The national government offset these costs through block grants of local tax-allocation subsidies in amounts covering interest payments (Homma 2004). Local tax-allocation subsidies are a routine local-government financing method in Japan whereby the national government uses allocation formulas to pay a portion of locally collected taxes back to local governments.

Through the Reconstruction Fund, the national government was able to provide extra financial assistance to Hyogo Prefecture and the City of Kobe for extraordinary recovery costs while reducing the attention and potential opposition of local governments outside the earthquake area. This fund, which mainly supported victims and community projects, was sizable but was relatively modest in comparison with the total costs of infrastructure and building reconstruction (in the trillions of yen, or tens of billions of dollars) to the national government and Hyogo Prefecture.

Hyogo Prefecture

Immediately after the earthquake, Hyogo Prefecture established its emergency headquarters and undertook emergency measures, such as lifesaving and firefighting. It also organized initial programs to procure emergency provisions and basic living supplies and ensure routes for their delivery to provide living assistance for displaced persons and to deal with aftershocks.

Hyogo Prefecture estimated direct losses of ¥9.93 trillion (US$99 billion) (Hyogo Prefecture 1999a). As conditions began to stabilize, the prefectural-government agencies began to focus on restoring essential services, including the construction of temporary housing, financial assistance to victims to reestablish normal lives and reopen businesses, measures to prevent secondary disasters due to aftershocks and weather, and the restoration of electricity, water, gas, and public transit systems.

Governor Kaihara Toshitami established a working team to consider the most appropriate procedures and approaches for the reconstruction efforts, and he ordered staff to gather documents and reports on the 1923 Great Kanto Earthquake, as well as recent earthquakes in the San Francisco Bay Area (1989) and Los Angeles (exactly one year earlier, on January 17, 1994) (Z. Ito 2004). When national-government officials were considering whether to create a national agency to lead recovery and reconstruction—similar to the one that had been established after the 1923 earthquake—Governor Kaihara advocated that the reconstruction should proceed under local autonomy and requested national-government support for locally based planning and implementation (Z. Ito 2004; Kaihara 2014). Planning for reconstruction was done locally through parallel efforts under the leadership of Hyogo Prefecture for the smaller cities and of the City of Kobe, in consultation with the national-government ministries that would be providing funding for the recovery projects and with stakeholder input that came through a number of different channels, mostly indirect rather than direct (Olshansky, Johnson, and Topping 2006).

Governor Kaihara established the Study Group for Urban Regeneration Strategy to provide a vision for reconstruction planning; it was chaired by Niino Kojiro, a renowned economist and former president of Kobe University (Z. Ito 2004). Professor Niino was also part of the advisory committee established by Kobe's mayor, which helped provide linkage and coordination across the prefecture's and the city's planning work (Niino 2014). The study group was composed of leading planning and engineering scholars, business leaders, and other stakeholders from the prefecture. Although it is customary in Japan to establish deliberative councils to help devise local comprehensive plans, given the time constraints, this group's charge was more narrowly focused on helping craft a vision to

guide reconstruction planning (Z. Ito 2004). It held a series of meetings beginning on February 1, 1995, and issued its first report, "A Strategic Vision for Reconstruction from the Hanshin-Awaji Earthquake," on March 1, 1995 (Z. Ito 2004). Input to this committee process came from surveys of earthquake victims, as well as ideas submitted by residents' reconstruction councils, academic and professional organizations, and municipal and prefectural community associations.

In tandem with the study group's efforts, the prefecture established a restoration headquarters on January 30, and the planning section began drafting basic concepts for a reconstruction plan, aligned with the planning charge and priorities provided by the national reconstruction committee led by Shimokobe and including Governor Kaihara (Z. Ito 2004; UNCRD 1995). Hyogo Prefecture and affected cities were under great pressure to submit proposals to the national government for financing major infrastructure and development projects in anticipation of the April 1 beginning of the 1995 fiscal year. The budgets for fiscal year 1995 had been authorized by the national government many months earlier and did not reflect earthquake reconstruction needs. Thus, Hyogo Prefecture and cities needed to develop new requests for national-government project subsidies as quickly as possible.

"Basic Concepts for the Hanshin-Awaji Earthquake Reconstruction Plan" was released in April 1995 and identified the areas that had suffered the heaviest damage as priority restoration districts. These districts would be the primary focus of large-scale national-government investments. The plan also reflected input from the smaller cities and townships affected by the earthquake and their reconstruction planning efforts, as well as the future planning vision already set forth in the prefecture's "Hyogo 2001 Plan," the result of a recent master-plan process.

Responding to heavy public criticism of the lack of public participation in planning decisions, Hyogo Prefecture, during the first six months after the earthquake, began to encourage cities to establish *machizukuri* citizen-participation processes (Kobayashi 2007). Legislators felt that it was important to include people in the formulation of plans and building restrictions. In many cases, the remedies developed by the citizens underscored flaws in city-led plans.

In an effort to fast-track another round of input into the planning process, the prefecture established the Hanshin-Awaji Earthquake Reconstruction Planning Policy Study Committee on May 11, 1995, chaired by the president of the Kobe University of Commerce, Miki Shin-ichi (Z. Ito 2004). Over the next month, this committee of experts and representatives of various groups and associations held 3 meetings of the full committee and 13 meetings of various subcommittees on industry and employment, insurance, healthcare and welfare, lifestyle, culture and education, and urban affairs.

The prefecture issued the first version of the Hanshin-Awaji Disaster Reconstruction Plan, named the Hyogo Phoenix Plan, on July 31, 1995. This 10-year plan contained 1,680 projects, costing ¥12 trillion (US$120 billion), and integrated all the city planning efforts in the prefecture (Edgington 2010). A stated purpose of the plan was to rebuild the region with a view to the future. This meant recognizing the aging of Japanese society and providing for aging people's welfare, enhancing culture and other life amenities in the region, creating new industries in the international economy, improving disaster resistance, and developing a multicentered metropolitan region (Hanshin-Awaji Earthquake Reconstruction Fund 1999). Within the prefecture, there were 18 land readjustment project areas and 12 urban redevelopment areas. The plan also called for the provision of 125,000 new housing units within three years (Hyogo Prefecture 1999a). Of these, 80,000 were to be financed by public funds and 45,000 by private funds.

Hyogo Prefecture and the cities helped promote a wide variety of existing national-government housing support programs as incentives for housing reconstruction. Construction of replacement housing occurred much faster than expected. Public housing projects that normally required several years of review by the Ministry of Construction took far less time because of the urgency of providing replacement housing. A national subsidy covering 75 percent of construction costs helped lower rents for newly constructed public rental housing (Olshansky, Johnson, and Topping 2006).

In general, throughout the recovery, the prefectural government provided information, coordination, and technical support to restore public

facilities, as well as financial support for certain kinds of housing. The national Housing and Urban Development Corporation, the nation's largest housing supplier, was commissioned by Hyogo Prefecture to execute 82 housing development projects in smaller cities in the prefecture, some of which had been initiated before the earthquake. Together, the Hyogo Housing Corporation, the Housing and Urban Development Corporation, and the Kobe City Housing Corporation formed the Disaster Public Housing Association to coordinate housing project tenant application and selection (Kinmokusei 1999). Priority was given to elderly households, as well as to those with infants or persons with handicaps.

Hyogo Prefecture, which had not previously supported *machizukuri* activities, followed the City of Kobe's lead in enhancing public information and consultation by supporting the formation of *machizukuri* groups in nearby smaller cities and helped establish two new *machizukuri* centers where citizens could obtain information about the reconstruction plans and implementation processes. The centers were funded partly by the Greater Hanshin-Awaji Earthquake Reconstruction Fund and partly by the City of Kobe, Hyogo Prefecture, and the national government.

In an effort to better understand the needs of individuals and the effectiveness of various government programs for individual recovery, Governor Kaihara established the Committee to Support Individual Recovery (Kaihara 2014). He assembled a team from the prefectural government and the public to investigate complaints, systematically gather community input, and feed it back into the prefecture's planning and implementation efforts. Hyogo Prefecture also acted as an intermediary between the national government and nine smaller cities and 10 rural townships, particularly in funding matters, and it helped these local governments with reconstruction planning and implementation. The City of Kobe operated more independently of Hyogo Prefecture because of its status as a semiautonomous city, although it was under the national government's oversight.

In 1998, Hyogo Prefecture estimated its total costs for reconstruction after the 1995 earthquake at about ¥4.75 trillion (US$47.5 billion) (Hyogo Prefecture 1999b). Some of the major expenditures were for urban infrastructure, public housing and housing assistance, port recovery and reconstruction, and retrofit of public buildings and bridges. The funding sources

were primarily reserve money and national-government supplemental budgets (Hyogo Prefecture 1999b).

The City of Kobe

Immediately after the earthquake struck, Kobe's vice mayor, Tsuruki Koichi, drove to the home of Kobe's mayor, Sasayama Yukitoshi, and they embarked together on a survey of the city. Sasayama later recalled, "I conducted my own damage assessment by 7 a.m. that morning on my way into work. Our first priorities were to address the immediate needs of residents. . . . But, I also started thinking then about the kinds of procedures that would

Kobe's old city hall, built in 1960, was among the many older, reinforced concrete buildings that collapsed mid-floor in the magnitude 6.9 earthquake. A few city departments were still located in this building in 1995. However, many had moved into the new city hall (in the background of this photo) built in 1989, which came through the earthquake unscathed. The old city hall was eventually repaired by removing the upper floors and strengthening a now shorter, five-story building. Photo by Laurie Johnson (1995).

be needed to implement my vision of the rebuilt city" (Sasayama 2009). He had served for many years as a city planner rebuilding Kobe's neighborhoods after World War II. In his words, he knew where the damage would be, given the geologic conditions and his knowledge of the neighborhoods that had been reconstructed properly after the war (Sasayama 2009). The debris and road congestion were so bad that it took Sasayama and Tsuruki almost two hours to go 5 km (3 miles) and then to city hall. Once Sasayama arrived at city hall, he did not leave again for over two months.

The city established its Disaster Management Headquarters at roughly 7 a.m. and simultaneously began formulating its recovery plan (City of Kobe 2010). Within the first day of the earthquake, Sasayama ordered a rapid damage assessment to understand the rebuilding needs and decided to pursue implementing a moratorium on post-disaster reconstruction in the city's hardest-hit areas, as is allowed under Section 84 of the Buildings Standards Law (Sasayama 2009).

On January 26, 1995, nine days after the earthquake, Sasayama formally announced the establishment of Kobe's earthquake restoration headquarters, which he would head, and outlined his basic vision for recovery (Edgington 2010). The "New Kobe City Basis Concept" was to "build a disaster-safe model city where citizens can live and work in a safe and secure manner" and "create a new Kobe that will become a civic-minded creative city interacting with the world" (City of Kobe 2010, 12). Sasayama added that the city would quickly formulate its recovery plan and "would not only restore the affected areas to their original states but also make life and the environment better than it was before the earthquake" (City of Kobe 2010, 12). The planning staff in the restoration headquarters was intentionally kept small, around 17 members, and included staff from many of the city agencies that had recently been involved in revising the Kobe City Master Plan.

The City of Kobe estimated total damage of ¥6.9 trillion (US$69 billion) (City of Kobe 2012). Although this figure was not yet known in the early days after the earthquake, city officials anticipated that the city's economy would be hit hard because of the significant damage to the port and other major employment centers, and that there would be substantial impacts on city revenues. Financial pressures, in great part, motivated the

city to accelerate its planning process in order to submit a funding request to the national government as soon as possible in the new fiscal year, which started on April 1, 1995.

To combat the time pressures, Kobe devised a two-phase planning process (City of Kobe 2010). In the first phase, the city decided on restoration projects for which the national government was willing to provide funds in fiscal year 1995. In the second phase, it worked out details of these projects with the citizens of Kobe. Although this approach was primarily aimed at land readjustment areas, the city also generally followed it in other planning areas.

The first phase, from mid-January to mid-March 1995, determined the basic citywide design for arterial streets and major parks, referred to as the Kobe City Restoration Plan Guidelines. The second phase featured review and modification of plans for internal street systems, land parcel layouts, park locations, and other design elements through *machizukuri* organizations. The second phase often generated additional subprojects. The Kobe City Restoration Plan was created during the second phase, but detailed planning within the specific project areas continued thereafter as well.

The Kobe City Restoration Plan Guidelines

The first phase of the City of Kobe's planning focused on basic citywide plans for major centers, trunk roads, and parks, both within and outside priority restoration districts. Although the first planning phase lasted only two months, it had significant and enduring effects on the physical, economic, and social fabric of the city. Because of time constraints, previous planning activities strongly influenced the planning policies and physical boundaries selected for the restoration promotion districts. The districts included areas that had previously been identified as hazardous and obsolete; large-scale redevelopment projects already under way next to the railroad stations at Shin-Nagata and Rokkomichi; and new waterfront projects that originated in waterfront reuse plans developed in the 1980s. The city also relied heavily on proposals and concepts defined in its city master plan, which had just undergone a major review in the months before the earthquake.

The city established a restoration planning committee to lead the development of the restoration plan guidelines (City of Kobe 2010). The committee's 27 members were administrative officials and scholars from wide-ranging sectors, including the economy, law, social welfare, social psychology, disaster prevention, engineering, and the environment. About half the members had also been members of the committee established to guide the city's recent master-plan review. The committee first met on February 7, 1995, and members were assigned to one of three subcommittees: urban infrastructure, citizens' affairs, or safe-city standards. There were at least 14 full committee or subcommittee meetings during the two months of the first phase.

During this time, the city also began formalizing its enforcement of building restrictions. On February 1, 1995, the city published its proposed policies for restricting rebuilding under Section 84 of the Building Standards Law, mostly in parts of the inner city that had suffered some of the greatest damage from the earthquake and subsequent fires (Edgington 2010). This moratorium was initially for one month and was later extended for two months in six districts with a total area of 244 hectares (603 acres). On March 17, 1995, the city planning department formally designated these six districts as areas to be rebuilt as either land readjustment or redevelopment projects (Kinmokusei 1999).

In addition, when the national government passed special legislation allowing greater flexibility in local rebuilding controls, the city expanded its priority redevelopment areas to cover about 1,225 hectares (3,025 acres) (Edgington 2010). These areas included the six original districts, which would remain under the stricter controls outlined in Section 84 of the Building Standards Law, and in which the moratorium was now extended to two years, and 18 other areas where any rebuilding activities would require city notification under the special legislation. This decision was formalized in the Emergency Earthquake Reconstruction Ordinance, enacted on February 16, 1995 (Kinmokusei 1999). This ordinance established goals and principles, such as resisting future disasters, providing good-quality housing, and working cooperatively with citizens. Most of the urban area of Kobe, totaling nearly 5,900 hectares (14,600 acres), was designated as a "disaster restoration promotion area," within which all construction of

buildings greater than two stories was regulated. Within this area, 24 districts were identified as priority restoration districts. Several other cities followed suit, and moratoriums were declared for heavily damaged areas across the prefecture. The availability of national-government subsidies influenced both the definition of moratorium boundaries and the selection of priority projects.

Parts of Kobe's disaster restoration promotion area were commonly classified as black, gray, or white zones, depending on the degree of public agency-led planning, funding, and regulation.

- Black zones were areas with high public agency-led planning, regulation, and funding for reconstruction and included land readjustment projects and land redevelopment projects. They constituted 2.9 percent of the restoration promotion area in Kobe.
- Gray zones had less public agency involvement and covered areas where various types of voluntary assistance programs were provided under local ordinances, and where certain reconstruction subsidies could be applied. They constituted 17.9 percent of the city's restoration promotion area.
- White zones had very little public agency involvement, and residents and businesses within these areas had to rely mainly on their own resources to rebuild, although some did receive some technical assistance from the city. White zones constituted 79.2 percent of the city's restoration promotion area.

The draft planning decisions were announced on February 21, 1995, were displayed for general inspection for two weeks, beginning on February 28, as required under the City Planning Law, and were then sent to the municipal and prefectural city planning commissions for review (Edgington 2010). A public meeting held at city hall on March 14, 1995, to discuss the proposal was met with public protests. Because of the short time frame for planning, the city had limited public participation; furthermore, some residents had been displaced to other areas, and it was difficult to communicate with them. Protesters expressed concerns about their lack of involvement in the planning process. Some affected residents also challenged

City-funded *machizukuri* planning consultants met regularly to share best practices and establish common protocols and approaches to assist local planning committees in interpreting guidelines for rebuilding city neighborhoods. Photo by Laurie Johnson (1995).

the land readjustment decisions, particularly the conditions to reduce their land size and relocate within the project area and the moratoriums on rebuilding (Mitsui 2014).

After the March 14 meeting, Sasayama held a press conference and announced a commitment to enhance public consultation and establish local planning committees (*machizukuri kyogikai* or *machi-kyo*) in the next phase of planning (Edgington 2010). The draft planning decisions were confirmed on March 17, and the Kobe City Restoration Plan Guidelines were released on March 27, ending the first phase of planning (City of Kobe 2010).

The Kobe City Restoration Plan

In the second phase of planning, the city selected 100 persons to serve on an earthquake restoration planning council and advise on the transformation of the restoration plan guidelines into a draft recovery plan (City of Kobe 2010). The council members included 40 academic experts; 1 city assembly member from each of the promotion districts; 43 representatives of various resident, business, and labor organizations; 8 officers from national and prefectural government-related organizations; and 3 vice mayors

of the city. The members formed a series of subcommittees to examine the plan from the viewpoint of various interests and areas of expertise and offer feedback and guidance to the whole committee. City departments committed to integrating their plans and budget requests for water and wastewater restoration, port repairs, housing, and other elements of recovery into the process.

During this phase, the City of Kobe and Hyogo Prefecture worked to expand local input on planning and helped establish *machi-kyo*. Specifically, the City of Kobe established a single one-stop office to help form and support new *machi-kyo* and dispatch expert consultants to assist the *machi-kyo* in dealing with rebuilding issues (Tsuruki 2004). The city called on citizens to help re-create a feeling of community by participating in the *machi-kyo*; however, some neighborhoods responded better than others. Some opposed the initial plans, whereas in other places, citizens worked together with the city to develop detailed plans. Vice Mayor Tsuruki later commented, "The largest achievement in recovery from the earthquake was expanding the voice of the people through the *machizukuri* process. The national government was opposed to this approach. It wanted to stick to traditional top-down recovery methods required under the Basic Disaster Law" (Tsuruki 2004).

The Kobe City Restoration Plan was published on June 30, with a budget of ¥9 trillion (US$90 billion) (City of Kobe 1995). Its goals emphasized building quality housing, creating a safe and pleasant living environment, restoring transportation infrastructure, and building a safer city. It contained 1,000 projects, of which 17 symbolic high-priority projects were identified. They included housing reconstruction, the land readjustment and urban development projects, the new eastern city center at HAT Kobe, rebuilding of the Port of Kobe, and construction of a new airport. The Kobe Reconstruction Emergency Three-Year Plan for Housing was published a week later, on July 7, and called for 82,000 housing units and the creation of a rent-reduction system (Kinmokusei 1999). These two plans were general policy statements rather than detailed land use or project plans. They essentially established the framework for recovery actions and provided the basis for obtaining national-government funds.

NOTABLE RECOVERY FEATURES

Land Readjustment and Redevelopment Projects

The City of Kobe established six land readjustment project areas with a total of 11 separate city-sponsored projects covering 126 hectares (311 acres) of urban land (City of Kobe 2012). Criteria for defining post-earthquake land readjustment areas included damage levels, fire and safety goals, and economic opportunities.

The *machizukuri* citizen-participation process was required for land readjustment project areas both to provide a forum for residents to discuss the plans and to help the city in developing the actual project plan. City staff working in the local ward offices helped residents, coordinated community organizations, and located residents who had moved outside the project areas in order to involve them in the appropriate *machizukuri* process.

In order to provide for wider roads and parks, each property owner received a new parcel that was proportionately smaller than the original parcel. Where streets were added or realigned, an owner's new parcel was not necessarily in the same place. When it could, the city purchased land from willing sellers who chose to leave the area; this helped add available land and minimize parcel reductions for those who remained. City expenses involved land purchase, road construction, and administrative expenses, including payments to the consulting planners assigned to work with the *machi-kyo*. In some cases, buildings that had survived the earthquake needed to be purchased and relocated to provide for improved road, land parcel, and park configurations. These purchases added to the cost.

The City of Kobe also established two large earthquake restoration urban redevelopment projects created under the Urban Redevelopment Law. These were located in south Shin-Nagata and in Rokkomichi and totaled 26 hectares (64 acres). Both reflected the pre-earthquake city master plan and were configured to create major new urban subcenters along the Japan Rail line west and east of Sannomiya, the center of Kobe.

A third urban renewal project was the New Eastern City Center, called HAT Kobe, also reflecting Kobe's pre-earthquake plan. This project was created by land readjustment of old industrial land rather than by the

Roads like this one in the Shin-Nagata land readjustment area were widened throughout Kobe as part of the post-earthquake rebuilding effort. Photo by Laurie Johnson (2013).

Urban Redevelopment Law (City of Kobe 2012). Over 3,500 public housing units were constructed in HAT Kobe to help meet the urgent housing demand after the earthquake. HAT Kobe also includes a World Health Organization center, several regional and international disaster preparedness offices, an earthquake museum and research center, and the prefectural art museum, designed by noted architect Tadao Ando. HAT Kobe was one of the key symbolic projects identified in the Kobe Restoration Plan.

A major complicating factor in reconstruction was Japan's land tenure system, which allows separate ownership and rental of land, buildings, and space within buildings.[8] All these parties were legal participants in land readjustment and redevelopment projects, although renters had a much more limited right than land or building owners. These complex land tenure conditions were major impediments to rapid on-site restoration of individual housing for small-parcel and building owners and posed significant difficulties for renters.

Reconstruction in the land readjustment areas proceeded more slowly than in other areas. As of midsummer 1999, city officials estimated that the land readjustment projects were only 43 percent complete (Olshansky, Johnson, and Topping 2006). Resolution of property rights was time consuming, and extensive surveying was needed to adjust survey points on property boundaries altered or distorted by ground deformation. The redevelopment projects at Shin-Nagata and Rokkomichi also took more than a decade to complete. Even so, both of these proceeded much faster than typical urban redevelopment projects in Japan (Japan Ministry of Construction, City Bureau 2000).

Machi-kyo also proliferated in the white zones outside the priority restoration districts and helped facilitate the small-scale planning activities that were needed to rebuild neighborhoods. The Kobe *machizukuri* center, which had existed in central Kobe since April 1992, reopened with more services on July 7, 1995 (Nakayama 1999). By late 1995, more than 100 *machi-kyo* existed in the city of Kobe (Evans 2001). Between 1995 and 1997, 80 percent of the 98 *machi-kyo* registered with the City of Kobe received financial assistance for a variety of projects and communication expenses (Nakayama 1999).

Housing and Economic Recovery

In June 1998, the City of Kobe established the Restoration and Rejuvenation Promotion Council, composed of local academic experts from a range of disciplines, to evaluate restoration progress and long-term issues (City of Kobe 2012). Over the next 18 months, the council conducted detailed studies and surveys of the overall recovery, socioeconomic rehabilitation, city safety, housing and urban reconstruction, the economy, the port, and culture; a series of self-organized workshops where citizens could express and discuss their opinions; and several public hearings. In January 2000, the council presented a series of proposals to the mayor for consideration. Among them, the council emphasized the need to bolster the economy and ensure a full recovery by focusing on countermeasures to the recession, promoting the creation of new industries, and providing greater support

for construction of a variety of types of housing to meet the diversity of residential needs and lifestyles.

Over time, the City of Kobe, as well as Hyogo Prefecture and smaller cities, promoted a number of approaches and incentives to facilitate housing reconstruction, including joint housing, bonus systems, cooperative housing, and collective housing.[9] The City of Kobe and Hyogo Prefecture also developed a wide variety of housing assistance programs, including rental subsidies and subsidized interest for housing loans. Private housing reconstruction was supported in various ways by the Hanshin-Awaji Earthquake Restoration Fund and other government-sponsored housing loan programs.

Condominium reconstruction posed complex reconstruction challenges because laws required that all parties with an interest in the project, including unit owners and landowners, reach a consensus on repairing or rebuilding damage.[10] If the owners could not reach unanimous agreement, the decision had to be made according to a special-majority rule of the laws that regulated the reconstruction of jointly owned buildings destroyed in the earthquake. Consensus was difficult to achieve because some owners had been displaced from the area, others did not fully understand their choices, and disagreements arose among owners. In July 1995, Kobe set up a system for dispatching specialists from the city's Housing and Urbanization Personnel Center to help condominium residents reach consensus on rebuilding and repair decisions (Yajima 1999). Over the course of reconstruction, city and prefectural housing bureaus and *machizukuri* consultants substantially helped build consensus and facilitate condominium repair or reconstruction. Over time, the national government allowed the level of consensus to vary and developed a variety of government-backed financing programs for condominiums and joint housing.

In the first two years after the earthquake, housing construction lagged behind other recovery efforts because of problems with financial resources, property rights issues, and housing needs (Olshansky, Johnson, and Topping 2006). Both the public and the private sector used a variety of strategies, aimed at many levels of the population, to ensure that replacement housing would get built. The result was that by about the third and fourth years after the earthquake, more housing had been built than had been lost.

During 2000 and 2001, as land readjustment and redevelopment projects continued, housing starts by the private sector remained at levels similar to those of 1999.

In terms of the total number of units, housing reconstruction was a great success. By October 2011, 296,874 housing starts had been reported in the city of Kobe since the 1995 earthquake (City of Kobe 2012). This demonstrates the scale of change that took place in Kobe, which had a total of 540,200 housing units in 1993 (Ikeguchi and Yamamoto 1999). However, not enough affordable housing was built in the locations that needed it most. Reconstruction was highest in the upper-income areas of eastern Kobe, whereas Nagata Ward, a lower-income area in western Kobe that was the most severely damaged, rebuilt only 66 percent of its units by 1999 (Olshansky, Johnson, and Topping 2006). New private housing did not meet the needs of lower-income and elderly residents of the older parts of the city. For many of them, public housing became the only option, but there was not enough of it in some areas that lost low-cost housing.

In October 1995, Kobe's population had declined by nearly 100,000 people from its January 1, 1995, estimate of 1,520,365 people (City of Kobe 2003). By the October 2010 national census, however, it was only 1.8 percent less than the pre-earthquake population, and, as of January 2016, the city's population was 1,550,831 (Japan Statistics Bureau 2016). The population distribution, however, has changed. The population in several wards, mainly in eastern Kobe, has increased, whereas that in others, especially in western Kobe, continues to be lower.

An ongoing series of random-sample surveys taken in Kobe in 1999, 2001, and 2003 provides additional insights on personal and household recovery of earthquake victims (Tatsuki 2007). The surveys identified housing as the most important element of life recovery, followed closely by social ties. The third most important element, land use planning, was markedly lower in importance, followed closely by physical and mental health, preparedness, economic and financial situations, and relation to government.

The 2001 survey showed a strong correlation between the degree of housing damage in the earthquake and the deteriorated condition of family or personal finances after the earthquake, such as decreased incomes and

savings and increased expenditures. Residents' feelings about their earthquake experiences improved over time. However, even in 2003, eight years after the earthquake, a notable 18 percent of survey respondents still thought of themselves as earthquake victims.

During the post-earthquake period, economic recovery in Kobe and Hyogo Prefecture proceeded unevenly, influenced by the poor performance of Japan's economy in the 1990s and the early years of the 21st century. By early 1998, 58 percent of Kobe businesses surveyed by the Kobe Chamber of Commerce and Industry had recovered by at least 90 percent (Chang 2001). By 1999, Kobe's economy had recovered 75 to 90 percent of pre-event capacity, depending on the sector (City of Kobe 2012; Hyogo Prefecture 1999a). Retail businesses and tourism were generally at 90 percent of pre-earthquake levels, and much of the gap was due to the national economy rather than the earthquake. Industrial production was generally at 100 percent of pre-earthquake levels (manufacturing output had recovered by the end of 1996); however, the synthetic-shoe industry and the sake industry never recovered and were both under 50 percent of pre-earthquake levels of production in 2010–2011 (City of Kobe 2012). All major port facilities were reconstructed by March 1997, although Kobe's port dropped from the world's sixth-busiest container port in 1994 to seventeenth in 1997. From 2007 to 2010, the number of container ships handled at the port annually hovered around 80 to 90 percent of pre-earthquake levels (City of Kobe 2012).

The earthquake stimulated new initiatives to restructure the economy over the long term to meet future competitive challenges from other regions. The City of Kobe, Hyogo Prefecture, and others in public- and private-sector economic leadership positions sought to generate new sectoral growth through redevelopment that would create added value in jobs, income, and investment beyond pre-event levels. Many small businesses obtained interest-free long-term loans from the Great Hanshin-Awaji Earthquake Reconstruction Fund. A variety of programs were directed at generating new industrial growth, and the City of Kobe pursued several economic revitalization initiatives to assist local industries and promote tourism.

One national-government response to the economic slump of the 1990s was to increase spending, particularly on public works; some of these public works investments were made in Kobe after the earthquake. As a result, however, government indebtedness soared to about 125 percent of GDP in 2001, and the local governments' share increased from 15 percent of GDP in 1990 to 37 percent by 2000 (Sorensen 2002). Although the earthquake's exact impact on the economy is difficult to measure, it clearly added to the nation's economic and financial difficulties and put severe financial pressure on local governments.

Indebtedness and reductions in national-government subsidies across Japan have been long-term concerns for both the City of Kobe and Hyogo Prefecture. For example, the cities of Kobe, Ashiya, and Nishinomiya

Kobe's central business district rises up from the harbor along Osaka Bay. The damaged port of Kobe is fully restored, but has never regained the volume of cargo shipping it had before the 1995 earthquake. Photo by Laurie Johnson (2013).

experienced substantial financial difficulty because of earthquake-related debt and insufficient subventions from the national government. In 2004, the City of Kobe had an extremely large amount of debt—approximately ¥290 billion (US$2.9 billion)—and had to respond by cutting staff, reorganizing, lowering salaries, and reducing social welfare programs (Tsuruki 2004). The city also tried to raise new revenues from land and asset sales. Like all local governments in Japan, Kobe likely would have faced financial shortfalls even if the earthquake had not occurred, but the large earthquake debts certainly added to Kobe's deficits early in the 21st century. Debt problems extended to individuals as well. Many disaster victims and business owners had difficulty repaying disaster recovery loans.

On January 17, 2017, residents of Kobe and Hyogo Prefecture gathered at 5:46 a.m. to remember those who had passed away 22 years earlier, just as they have each year on this day. In the city of Kobe, this gathering takes place at the park next to city hall, which today is surrounded by many new upscale residential and commercial developments that have been built since 1995. To most visitors, Kobe is a vibrant, cosmopolitan city, completely recovered from the disastrous earthquake of January 17, 1995. The infrastructure and downtown were rebuilt within a few years of the earthquake, and Sannomiya is once again a thriving commercial center with few vacancies.

Most neighborhoods have been rebuilt, although pockets of vacant or underused land remain, particularly in the less affluent parts of western Kobe. Housing and commercial buildings reconstructed under post-1980 seismic safety standards of the Building Standards Law have created generally safer conditions, especially in combination with improved water systems for firefighting. The construction of massive clusters of tall buildings had varying effects on both the landscape and lifestyles. The earthquake also created many community-level opportunities for improvement: parks, safer buildings, multicore development, and road widening. The rebuilding process brought basic physical, social, and economic changes to Kobe and nearby cities.

Disaster Management Reforms

Starting almost immediately after the 1995 earthquake, Japan's national government made a number of reforms to the country's disaster man-

agement framework to better prepare for large-scale natural disasters, acts of terrorism, and other events requiring the protection of lives or assets. At all levels of government, more emphasis was placed on emergency response and relief planning as part of disaster management planning.

In 1998, the position of deputy chief cabinet secretary for crisis management was created as a specialized central coordinator, and the Office for Crisis Management was subsequently established in the Cabinet Secretariat to support policy planning, along with the Cabinet Information Collection Center to enhance national-level emergency information and data collection and decision making in large-scale disasters and serious accidents. In 2001, the position of minister of state for disaster management was created, integrating for the first time a number of disaster management functions that had previously been spread across several government agencies, to ensure better integration and coordination of disaster management policies carried out by numerous ministries and agencies (Japan Cabinet Office 2011a). The director general for disaster management is mandated to undertake the planning of basic disaster management policies and response to large-scale disasters, as well as to conduct overall coordination.

Enhancing assistance to disaster victims has been another area of policy change since the 1995 earthquake. In 1998, the national government enacted the Act on Support for Livelihood Recovery of Disaster Victims to provide up to ¥1 million (US$10,000) per household to replace damaged household goods and belongings (Japan Cabinet Office 2011a). The act was revised and expanded in 2004 to provide up to ¥2 million (US$20,000) to cover expenses for housing demolition and stabilization of living conditions. This assistance is available only to disaster victims whose homes are severely damaged by a natural disaster and who face economic or other personal difficulties as a result of the disaster.

Legislation adopted in 1995 and expanded in 2004 aims to encourage seismic retrofitting of high-occupancy buildings, structures critical for emergency response and human services, public facilities, such as municipal offices, and private buildings. There are requirements for local governments to develop plans and priorities for seismic strengthening in their

communities, financial subsidies for building analysis and retrofit work, and tax incentives for the retrofit of private residences and commercial buildings.

THE 2011 GREAT EAST JAPAN EARTHQUAKE AND TSUNAMI

The Tohoku region of Japan is renowned for its abundance of agricultural and fishing resources, geographic remoteness, and mountainous terrain. It consists of six prefectures, three of which (Iwate, Miyagi, and Fukushima) face the Pacific Ocean. However, many of the region's 9.6 million residents, as well as its rail lines and roadways, are concentrated in the inland valleys, and the coasts are more sparsely populated. The majority of the region's development occurred between the 1970s and the late 1990s, commensurate with the nation's strong economic growth. Since that time, the region has endured increasing economic decline, employment challenges, and population decline from aging and out-migration; coastal communities have been particularly affected (Ubaura 2015).

Ten percent of Otsuchi's 16,000 residents, including the town's mayor and nearly 50 town employees, perished in the tsunami in March. Photo by Robert Olshansky (2011).

The Pacific coastline of this region is also the historic location of some of Japan's largest and deadliest tsunamis. The 1896 Meiji Sanriku earthquake and tsunami killed 22,000 people; the 1933 Showa Sanriku earthquake and tsunami caused 3,000 deaths; and the 1960 Chile tsunami took 142 lives along this part of the coast (Japan Cabinet Office 2011b). Researchers have been studying the Jogan Sanriku earthquake of 869 and the Keicho Sanriku earthquake of 1611, which caused massive tsunamis, but insights from that work were not yet incorporated into the region's tsunami hazard assumptions and emergency planning in early 2011 (Central Disaster Management Council 2011).

On March 11, 2011, a magnitude 9.0 earthquake off the Pacific coast of the Tohoku region generated tsunami waves with record heights of 9.3 meters (30.5 feet) and run-up heights of 35 meters (115 feet) that inundated over 560 square kilometers (216 square miles) of coastal land (Central Disaster Management Council 2011). Together, the Great East Japan Earthquake and Tsunami and the subsequent nuclear disaster are one of the world's worst modern catastrophes. In all, 15,880 people perished, and 2,694 are officially reported as missing; over 1.1 million buildings were damaged, of which nearly 400,000 were either completely destroyed or severely damaged; and the direct financial damage to buildings, utilities, and social infrastructure was estimated at ¥16.9 trillion (US$169 billion) (Reconstruction Agency, Government of Japan 2016b).[11] Nearly half a million people evacuated in the first week, and although the last emergency shelter closed in February 2012, approximately 140,000 people were still displaced as of October 2016 (Abe 2014; Reconstruction Agency, Government of Japan 2016a).

Evacuees from Fukushima Prefecture have faced a much more complex and long-term evacuation, with a more uncertain future. Early on, residents within a 20-km (12.4-mile) zone were forced to evacuate. Later, people even farther away were affected as the contamination spread. The evacuation order lasted for about six months. After several revisions, contaminated areas were separated into three zones based on the level of radiation and their future potential for reoccupancy (Reconstruction Agency, Government of Japan 2016a).

In September 2011, families visited a school near Onagawa where children had perished in the tsunami. The land elevation of much of the Tohoku coastline subsided as the earthquake shifted the earth's crust, increasing coastal flooding. Photo by Laurie Johnson (2011).

ORGANIZING FOR RECOVERY

The National Government

As the ground motions were being felt in Tokyo, national leaders were assembling in various ministries and at the prime minister's office to begin gathering information on the disaster and determining appropriate responses (Okamoto 2014). Within the first hours, the national Extreme Disaster Management Headquarters was convened for the first time in the nation's history and began defining national-level relief and recovery responsibilities for the earthquake and tsunami disaster. The National Nuclear Emergency Headquarters for the nuclear incident was also established, headed by the prime minister (Okamoto 2014). The government began dispatching inspection teams to the Tohoku region by nightfall.

During the first weeks and months after the March 11, 2011, disaster, the focus was appropriately on the urgent matters of search and rescue,

mass care, shelter of the Tohoku region's populace, emergency repairs to lifelines and critical facilities, and removal of the massive fields of debris left in the tsunami's wake. Government and service organizations faced enormous obstacles in offering relief assistance because of the large area affected, limited accessibility, difficult weather conditions, and the ongoing crisis at the Fukushima nuclear power plant.

However, in parallel with these urgent activities and amid the unprecedented challenges of the devastation, government leaders and residents began the difficult process of determining just how and where to rebuild. Shortly after the disaster, a small task force was established to help prepare a suite of new legislation to facilitate recovery and support national planning efforts (Nagai 2011). Its initial staff of about 10 people came from the Cabinet Office, the national disaster management agency, and cabinet ministries, but it grew quickly over the next weeks and months to become the nation's unofficial reconstruction agency. For the first time, national-government field offices were established in Iwate, Miyagi, and Fukushima Prefectures and staffed with representatives from prefectural- and national-government agencies; these offices coordinated responses and information reporting among the national, prefectural, and local governments (Nagai 2011).

The national government officially designated the earthquake and tsunami as a "disaster of extreme severity" on March 1 and authorized national relief programs and subsidies under the Basic Disaster Relief Law and the Act on Support for Livelihood Recovery of Disaster Victims (Japan Cabinet Office 2011b). Under these and other emergency measures, the national government distributed far greater aid to individuals and small businesses than in previous disasters, including grants for housing reconstruction, unemployment and job support, and assistance for the agriculture and fishing industries.

On April 27, 2011, Japan's Central Disaster Management Council established a technical investigation committee for the March 2011 disaster. This committee led the national government's investigations of the disaster's impacts, lessons learned, and recommendations for future risk management strategies (Central Disaster Management Council 2011).

The Reconstruction Design Council

One month after the disaster, Japan's prime minister established the Reconstruction Design Council, which was charged with developing general concepts and strategies for recovery and rebuilding. Its 15 members came from academia, business, and religious groups, along with the governors of Iwate, Miyagi, and Fukushima Prefectures. This was the first such national-level post-disaster planning committee since the Great Kanto Earthquake of 1923. In addition to the main council, a 19-member study group was established to provide technical support. Both the council and its study group held a series of meetings; most took place in the Cabinet Office and were closed to the public, but their work was posted on the Cabinet Office website (Japan Ministry of Foreign Affairs 2011).

The council released its national recovery vision, titled "Towards Reconstruction: 'Hope Beyond the Disaster,'" on June 25, 2011 (Reconstruction Design Council 2011). The vision presents general concepts and strategies for physical recovery; ideas for job creation and regional economic recovery; and proposals for sustaining and ultimately resolving the Fukushima nuclear crisis, repositioning Japan in the global economy, and promoting long-term research on recovery. Most sections of the vision underscore the importance of local governments in leading recovery, with one notable exception: Section 3 gives the national government lead responsibility to deal with the nuclear incident and the associated recovery.

The council's vision was the first document to introduce the concept of disaster reduction into planning for recovery from the March 2011 disaster. It called for a two-level approach to future tsunami risk management and was derived in part from recommendations of the Central Disaster Management Council's investigation committee (Japan Ministry of Foreign Affairs 2011). At the first level, hard measures, like levee construction, were recommended to address more likely future tsunami heights. At the second level, softer measures, such as controlling land uses in the rebuilding and enhancing evacuation planning and drills, were recommended to deal with extraordinary and less likely tsunamis. Five schemes of future land use patterns to reduce the impact of tsunamis were presented, each reflecting different geographic and damage characteristics, with a mix of

relocation, large-scale land elevation, and levees. Altogether, the council's vision represented a fundamental shift in disaster-related policy making in Japan, which has traditionally focused on disaster prevention to avoid disaster damage altogether. It was also an important signal of the long-term and large-scale transformation and commitment to reconstruction that Japan's national government would make (Iuchi, Johnson, and Olshansky 2013).

After this, MLIT led a 10-month, Tohoku-wide survey to assess the overall damage and develop rebuilding strategies to fit local conditions (MLIT 2012b). The survey targeted 62 disaster-affected local governments in six prefectures and developed basic land use recommendations for rebuilding for 32 coastal local governments. Tsunami simulations incorporating different potential designs for coastal protection were conducted as part of this survey with the goal of identifying tsunami-vulnerable areas in each locality. The concept of defining level one (L1) and level two (L2) tsunamis emerged during the course of MLIT's work. On the basis of historic tsunamis in the Tohoku region, an L1 tsunami was defined as an event occurring once every 10 to 100 years (or having a greater than 1 percent annualized probability of occurrence), and an L2 tsunami was defined as an event occurring once every several hundred to 1,000 years (or having less than a 1 percent annualized probability of occurrence). The March 2011 tsunami was classified as an L2 tsunami. A policy consensus emerged that large-scale structural measures, such as levees, would be designed and built to defend and protect land and people against L1 tsunamis, while nonstructural measures, mainly land use patterns and evacuation plans, would be implemented in addition to levee defenses to secure human lives against L2 tsunamis (MLIT 2012a).

MLIT hired national consultants to help local governments develop land use plans that incorporated the L1 and L2 tsunami protection concepts along with the land use strategies envisioned in the national recovery vision. The national consultants ran tsunami simulations to identify potential inundation areas from L2 tsunamis. Since prefectures are the government level responsible for coastal management in Japan, they made the official decision about where levees would be constructed and to what heights. Levee heights for rebuilding were established in 24 bays in Iwate

Prefecture, 22 bays in Miyagi Prefecture, and 14 bays in Fukushima Prefecture, with recommended levee heights as high as 15.5 meters (51 feet) in Iwate Prefecture and as low as 2.4 meters (8 feet) in Fukushima Prefecture (MLIT 2011). In many bays, the levee heights exceeded the pre-earthquake levee heights.

After the prefecture-designated levee heights were included, MLIT consultants modeled the potential inundation areas if tsunamis overtopped the proposed levees, and from this, they developed a proposed land use plan for each local government that avoided rebuilding residential areas in the potential inundation areas. Five generalized land use strategies emerged from these analyses: (1) relocate inland away from the tsunami inundation areas; (2) consolidate residential areas in nearby safer locations; (3) consolidate residential areas on artificially raised lands; (4) partially relocate residential areas inland and partially consolidate residential areas on raised lands; and (5) rebuild on-site (MLIT 2012b; figure 4.1). Armed with this information, local and prefectural governments, together

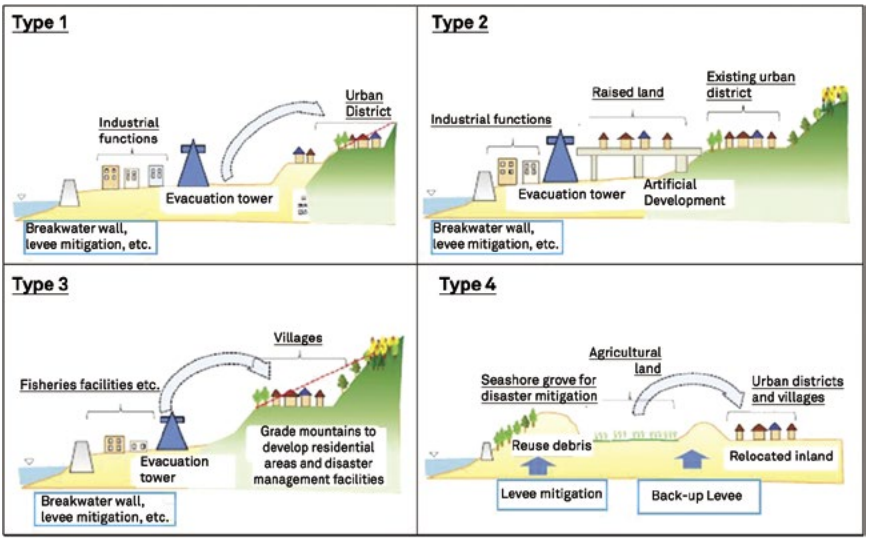


FIGURE 4.1.
Pictured are four of the five types of generalized land use patterns proposed by the national government for recovery in the Tohoku region. The fifth type involves rebuilding on-site and did not include an illustration. *Source*: Reconstruction Design Council (2011).

with MLIT and other national-government agency staff, began the more arduous process of consulting with citizens and planning for rebuilding.

The Reconstruction Agency

The national recovery headquarters explored several governance models for managing the recovery (Okamoto 2014). One approach was to have the headquarters in the prime minister's office lead the national-level reconstruction, as had been done after the 1995 Hanshin-Awaji earthquake. In this case, the various ministries would maintain and implement their own budgets. Another approach was to establish a reconstruction ministry and integrate the budgets and functions of different ministries into it. The scale and complexity of the disaster, the vast number and the varying governance capacity of the more than 200 local governments, and the multiprefectural governance arrangements were all factors that had to be considered and differed from the 1995 Hanshin-Awaji or 1923 Tokyo experiences. The approach selected was a combination of the 1995 and 1923 approaches, with the establishment of the national Reconstruction Agency reporting to the prime minister, managing the overall recovery budget, and transferring funds either to different national ministries or directly to local governments (Okamoto 2014).

On June 20, 2011, just a day before the council released its recovery vision, Japan's Diet approved special legislation calling for the immediate establishment of a national, Cabinet Office headquarters for recovery (Matsuo and Takamoto 2011). It recommended that this headquarters be responsible for developing recovery strategies and policies along with the national Reconstruction Design Council illustrations of the reconstruction concepts for tsunami-resilient communities. Shortly thereafter, the prime minister appointed a minister for the provisional agency, but Japan's Diet did not approve the formal establishment of a national reconstruction agency until December 2011 (M. Ito 2012). The Reconstruction Agency finally made its official debut on February 10, 2012, 11 months after the March 2011 disaster.

The national Reconstruction Agency encompasses many of the previous organizations and task forces established after the March 2011 disaster. It

has a national headquarters, three offices—one each in Iwate, Miyagi, and Fukushima Prefectures—and eight branch offices, predominantly in the heavily affected communities along the coast. The agency is charged with helping speed the process of rebuilding by working across the various national government ministries that oversee different reconstruction programs (M. Ito 2012). It also serves as a focal agency in administering recovery activities so that the local administrative procedures for affected local governments can be reduced. The agency has a staff of more than 400 people and about 30 section managers (Okamoto 2014). Several national-government ministries provided staff to the Reconstruction Agency, including staff in the local bureaus, who have helped with horizontal coordination among the ministries, as well as vertical coordination between the different levels of government. The agency is authorized to run until at least October 2020. An oversight committee, the Reconstruction Promotion Council, composed of experts and government leaders, was established to monitor reconstruction quality.

Over the course of 2011, Japan's Diet approved three supplementary budgets totaling ¥15.16 trillion (US$ 151.6 billion) (Iuchi, Maly, and Johnson 2015). Much of the first two supplementary budgets of ¥4.01 trillion and ¥1.91 trillion (US$59.2 billion in total) was for emergency response and early rehabilitation and reconstruction activities. The third supplementary budget of ¥9.24 trillion (US$92.4 billion) focused more on funding longer-term rebuilding. It allocated ¥1.9 trillion (US$19 billion) for the establishment of a recovery fund that was approved in September 2011 to help provide ongoing subsidies to local governments to manage local recovery and reconstruction costs (MLIT 2012a). The Reconstruction Agency monitors the fund.

The national government developed a framework of reconstruction guidelines and policies, and local governments must submit applications that are aligned with the national guidelines in order to obtain recovery funds (Reconstruction Agency, Government of Japan 2012). The national government initially defined over 40 programs related to basic infrastructure rebuilding for which local governments could apply for funding. Special legislation eliminated the local-government contribution that is normally

required under the Disaster Countermeasures Basic Act, so local governments have an incentive to apply to use these programs since the national government covers all costs. The Reconstruction Agency also manages recovery funds for other types of programs, such as the construction of levees and breakwaters, in collaboration with responsible ministries.

The key national recovery programs that address the physical rebuilding of local areas are the collective relocation program, the land readjustment and raising program, the public housing program, and a special tsunami recovery zone program (Iuchi, Johnson, and Olshansky 2013). The collective relocation program was initially established in 1972 under the Act on Special Measures for National Finance Regarding the Collective Relocation Program for Disaster Prevention and has traditionally been used to promote the relocation of disaster-prone communities before disasters. The program was used on a much smaller scale in prior disasters, such as the 2004 Chuetsu earthquake, to relocate communities to less hazardous areas. In the Tohoku region, its proposed use is for relocating communities from tsunami hazard zones to less hazardous areas.

The land readjustment and large-scale land elevation program is being applied in areas that are rebuilding in place. Its main focus is land elevation, rather than just road widening, parcel realignments, and the creation of open space, for which it was used after the 1923 and 1995 earthquakes.

The public housing program for disaster victims was originally established under the Act on Public Housing of 1951. It was listed as one of the national recovery programs so that local governments could provide subsidized rental public housing for disaster survivors without the financial capacity or ability to rebuild their own houses.

The special tsunami recovery zone program was established through national legislation passed in October 2011 that allows for the establishment of special zones in which more flexibility in rebuilding is provided than in traditional planning programs. These zones can be established in either urban or rural areas, and funds can be used for both industrial and residential purposes, as well as mixed-use redevelopment. This program funds redevelopment of the basic urban systems in devastated localities if

facilities that help reduce future tsunami impacts are also built there. This program also aims to reduce complex land use procedures by allowing urban development on agricultural land.

The Reconstruction Agency established a procedure for local and prefectural governments to follow in applying for and receiving national recovery funds for these programs (Iuchi, Maly, and Johnson 2015). The procedure includes several exchanges among local governments, relevant ministries, and the Reconstruction Agency. A local government must first complete a recovery plan that is reviewed by the Reconstruction Agency. It can then submit applications for specific recovery project funding to the Reconstruction Agency, but to qualify for evaluation, these applications must include detailed designs and implementation plans for the programs. The Reconstruction Agency then manages the funding decisions and allocations to relevant ministries and notifies local governments about the approval decisions and funding amounts. There is no limit on the number of applications local governments can submit.

On March 2, 2012, the Reconstruction Agency announced that the first allocation of recovery subsidies, totaling ¥251 billion (US$2.5 billion), would be distributed to 59 local governments in seven prefectures (Sankei Newspaper 2012). Responses were mixed because the amounts allocated to local governments varied significantly. For example, local governments in Miyagi Prefecture received only 58 percent (¥116 billion, US$1.4 billion) of their total request, while those in Iwate Prefecture received 94 percent (¥79.8 billion, US$ 1 billion) of their total request (Iuchi, Johnson, and Olshansky 2013). Over time, 67 local governments have been awarded national recovery program funding (Reconstruction Agency, Government of Japan 2016a).

Prefectures

Iwate, Miyagi, and Fukushima Prefectures are the three prefectural governments most heavily affected by the March 2011 disaster. Generally speaking, all three prefectures have instituted similar recovery governance structures and followed similar planning processes; however, because of

the large-scale evacuation and contamination issues in Fukushima Prefecture, its efforts have progressed more slowly.

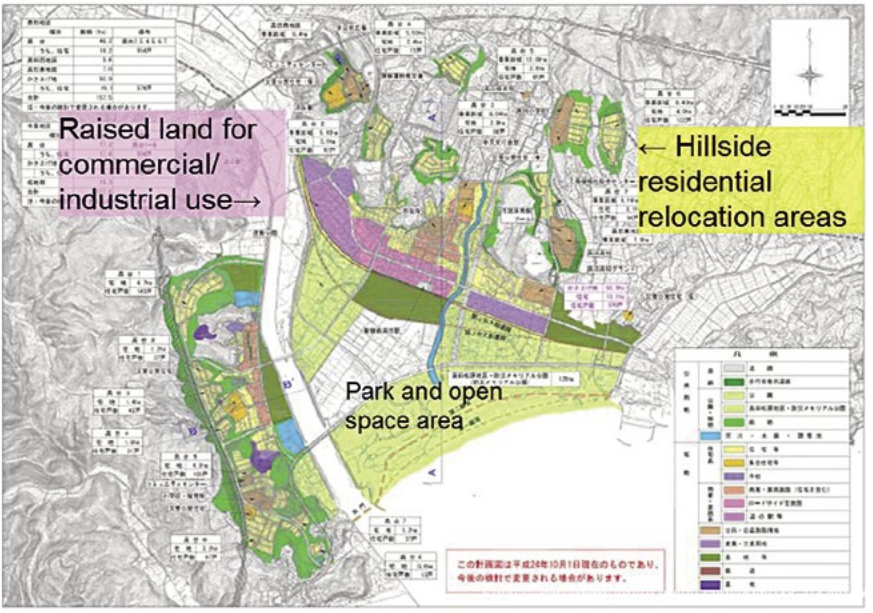
Shortly after the disaster, each prefecture established its own reconstruction bureau to lead prefectural-level planning and implementation and support the reconstruction work, as well as recovery committees to advise on the recovery processes. Similar to the national Reconstruction Design Council, each of these committees was composed of local-government, industry, and community leaders, as well as academics.

Iwate Prefecture completed its draft reconstruction plan on June 9, 2011, and, over the summer months, focused on developing local recovery plans and gathering input from cities and residents. The final plan was published on August 11, 2011 (Iwate Prefecture 2011). It sets goals to protect lives, live with the sea and the earth, and strengthen community well-being in Iwate and Sanriku, and its principles include promoting safety, resilient cities, tsunami mitigation, coastal-protection facilities, and city facilities. It also includes a set of recommended reconstruction patterns that are generally consistent with the national reconstruction vision. Some specific policies and projects proposed in the plan include completing a disaster-resisting trunk road network; providing financial support for housing reconstruction; rebuilding medical systems; moving urban functions to higher ground while keeping neighborhoods together; and revitalizing the economy, both through improving existing industries, including fishing and tourism, and through new activities, such as the creation of a new national technology research center. The plan sets a nine-year time frame for rebuilding, with the caveat that a significant commitment of national funds is needed.

By June 2011, Miyagi Prefecture had developed planning concepts, which it called a reconstruction proposal, that it was sharing with cities and residents. Cities in the prefecture were simultaneously developing their own plans using the prefecture's concepts and were formulating more specific policies and approaches to implementation. Miyagi Prefecture incorporated this local feedback into its reconstruction plan, which was formally adopted on October 19, 2011 (Miyagi Prefectural Government 2011b). Two patterns of reconstruction are featured in the plan: (1) for

urban areas, moving housing toward the hillsides and moving industry closer to the water, but behind tsunami levee protection structures; and (2) for rural areas, adding tsunami protections, like elevated highways or rail lines, to protect agricultural areas. The plan also includes a variety of infrastructure and economic development concepts, such as developing better linkages between urban areas; promoting tourism; thinking more strategically about cooperation in port reconstruction; and promoting energy efficiency and ecoindustrial park development. Miyagi Prefecture estimated total costs for reconstruction at ¥12.83 trillion (US$128 billion) over 10 years.

Fukushima Prefecture completed its draft plan by the end of December 2011 after complications and delays resulting from the nuclear incident (Fukushima Prefectural Government 2011). Aomori Prefecture in far east-



The post-disaster recovery plan for the city of Rikuzentakata proposed relocating residential development into the hillsides (yellow) and placed commercial and industrial development on raised land (pink) away from the coastal plain, which would be converted into parks and permanent open space (light and dark green). *Source*: Disaster Recovery Plan, City of Rikuzentakata, Japan (2011).

ern Honshu developed a recovery plan by December 2011; far less of its coastal area was affected by the March 2011 disaster than the coastal areas in the other three prefectures.

Local Governments

Amid the chaos in the weeks after the March 11, 2011, disaster, local governments along the Tohoku coast began organizing for long-term recovery. Many had lost a tremendous number of staff in the disaster. Prefectures dispatched staff to affected cities, and in some instances, these staff served in top leadership positions for an extended period. Several governors in the Kansai region banded together to offer staff assistance through a national support network. National-government ministries sent staff and experts to work with associated ministries in the prefectures and the severely damaged cities and towns; and for the first time ever, MLIT provided funds to affected cities and prefectures to hire consultants to assist with damage assessment and recovery planning (Iuchi, Johnson, and Olshansky 2013). Many academics served on prefecture and local recovery committees; some academics served on more than one committee.

Although specific plan contents varied, almost all plans featured principles and policies for planning land use, promoting industry and economic revitalization, managing and reducing disaster risk, and protecting lives and the environment; all set 7- to 10-year targets for rebuilding. The local planning processes also shared many similarities: establishing local advisory committees, integrating national and prefectural reconstruction concepts into local plans, and involving citizens in the planning. However, the pace of planning varied considerably. Some cities initiated efforts soon after the disaster and announced plans within the first two months. Others took much longer and, in some cases, required technical support from outside planning professionals and prefectural-government staff. Technical assistance for planning came from professionals with different affiliations and lengths of involvement.

The levels and methods of citizen involvement, the ways in which their input and priorities were considered, and approaches to considering future tsunami risk management also varied by locality. Some localities shared

information and collected citizen input through surveys, workshops, and newly created *machizukuri* committees. As in Kobe, *machi-kyo* have been established in most tsunami-affected communities in the Tohoku region and are facilitating resident and business-community input into recovery plans and specific recovery projects like land readjustments and collective relocation programs. Often, the *machi-kyo* conducted their own outreach and developed recovery plan concepts concurrently with the government efforts, which helped integrate citizen input early in the planning process that was subsequently incorporated into draft local plans. Other localities, particularly larger cities, conducted more limited outreach, mostly via early-stage questionnaires and public hearings at a midpoint in draft plan preparation. As the draft plans neared completion, public presentations focused on sharing information rather than soliciting feedback.

After the prefectures released their advisory levee heights in September and October 2011, local governments enlisted the help of academics and consultants to model the depth and extent of inundation from 1,000-year tsunami scenarios in combination with the recommended L1 protections. In most localities, areas that were modeled as having less than 2 meters (6.6 feet) of tsunami inundation were designated as safe for rebuilding—another policy concept that has arisen out of national-level, post-disaster investigations (Central Disaster Management Council 2011). In most local plans, safe lands are recommended for rebuilding of residences, and industrial uses are proposed predominantly in the potentially unsafe areas. If safe areas are unavailable for residential uses, homes are proposed in potentially unsafe areas if the land is artificially elevated. Thus, most local land use plans show industrial, ecological, and park-related uses closer to the coastline, and residential uses farther from the coastline or on artificially elevated lands.

Local land use decisions were not based solely on the tsunami simulations and levee heights proposed by the prefectures; other community priorities for rebuilding were also influential. In some cases, localities proposed higher levees to increase safety, while others wanted lower heights, mainly to account for community concerns for aesthetics and future coastal access. Decisions on where and how to rebuild—in safe, higher-elevation areas or on artificially elevated lands—and whether to move collectively or in

smaller groups, as well as the notion of collective community relocation, have been sources of continuing debate (Ubaura 2015). Most local plans propose rebuilding residential areas through collective relocation of communities to higher-elevation areas or by artificially elevating lower-lying lands using the land readjustment program. Some communities are reluctant to rebuild in place even if the land is artificially raised. But many of these localities are geographically constrained by surrounding steep slopes and lack available, safe lands for relocation. Others view collective rebuilding of merged neighborhoods as potentially sustaining communities previously facing long-term population decline.

Some localities have restricted private reconstruction for extended periods. Like Kobe and other cities in Hyogo Prefecture after the 1995

In January 2014, massive land-raising operations were under way in the city of Rikuzentakata, Japan, as well as many other coastal communities affected by the 2011 earthquake and tsunami. Earth was excavated to prepare new housing sites in the hillsides and was conveyed downhill to elevate land along the harbor. Photo by Iuchi Kanako (2014). Reprinted with permission.

earthquake, most have used Section 84 of the Building Standards Law to initially issue two-month moratoriums and then have worked with their prefectural governments to extend them until recovery plan restrictions and program conditions are in place (Iuchi, Johnson, and Olshansky 2013; Miyagi Prefectural Government 2011a). A few localities designated certain areas as hazardous under Article 39 of the Building Standards Law to permanently prohibit rebuilding. In addition to wanting to prevent ad hoc rebuilding, many localities instituted the moratoriums to present a sense of urgency to the national government so it would act quickly in designing and funding recovery programs (*Kahoku Newspaper* 2011).

NOTABLE RECOVERY FEATURES

As the second anniversary of the March 2011 disaster neared, criticism mounted over the slow pace of recovery in the Tohoku region, particularly in housing reconstruction and decontamination of radiation-polluted areas. In February 2013, Prime Minister Abe Shinzo outlined a series of major reforms to both the Reconstruction Agency and the recovery programs with the goal of accelerating reconstruction in the region (Nemoto 2014). Until then, the Reconstruction Agency had its headquarters solely in Tokyo and was supported by regional operations throughout the Tohoku region. Prime Minister Abe established a second headquarters in Fukushima to work in parallel with the newly established Tokyo Headquarters for Fukushima Reconstruction and Revitalization based at the Reconstruction Agency to help provide more onsite focus and accelerate decontamination and recovery efforts in that region. The Fukushima Headquarters for Reconstruction and Revitalization integrates the work of the Reconstruction Agency's regional bureau with that of the Fukushima Office for Environmental Restoration, which coordinates decontamination efforts, and the local Nuclear Emergency Response Headquarters, which manages evacuation zoning in and around the Fukushima nuclear power plant.[12] The national government also dispatched personnel from other local governments across the country, retired public officials, and citizens with practical experience to work on recovery implementation in disaster-affected communities (Nemoto 2014).

A task force to accelerate community and housing reconstruction was established under the minister of reconstruction. It compiled a series of recovery funding and implementation measures intended to help accelerate recovery. One such measure was to increase the flexibility of national recovery programs. In 2013, the Reconstruction Agency began allowing local governments to apply for funding with different ideas that are related to the national recovery programs but not explicitly covered by them. Since 2013, local governments have been applying for and implementing projects such as construction of evacuation routes, rebuilding workshops, and other programs necessary for the local areas. However, local governments must bear 20 percent of the total cost of these projects, and the Reconstruction Agency cannot allow these projects to exceed 35 percent of the budgets allocated though the principal recovery programs (Iuchi, Maly, and Johnson 2015).

Despite the reforms and broader program definitions, getting funds to local governments and into actual implementation continues to be a challenge. The Reconstruction Agency has blamed labor shortages, shortages and surging prices of materials, and difficulties in securing storage sites for contaminated soil materials and in coordinating the reconstruction plans with residents (Kyodo 2013, 2014). Closer examination showed that over half of ¥1 trillion ($10 billion) in the 2013 fiscal year budget for post-disaster restoration went unspent, partly because of the lack of local agreement on seawall heights, as well as for other reasons; in some cases, construction companies canceled contracts because of the soaring material costs (Kyodo 2014).

Furthermore, the recovery projects implemented under the national programs are numerous and complex and simply require time to complete. Collective relocations involve careful interactions with residents and landowners to gain consensus and minimize the negative consequences of relocation. Consolidation and reapportionment of lands in consultation with residents and landowners take time. Adopting a new program for tsunami recovery zones requires detailed land use planning in consultation with residents and landowners. The Reconstruction Agency estimates that nearly all the 20,000 new housing units in the collective relocation areas, as well as the 30,000 new public housing units in disaster-affected

communities, will be completed by March 2018 (Reconstruction Agency, Government of Japan 2016a). Of the 67 local governments that have received national recovery funding, 48 are scheduled to complete their housing-related recovery projects by March 2017, and the other 19 are scheduled to complete theirs by March 2019.

By March 2015, the national recovery budget of ¥25.5 trillion ($255 billion) for the first five years had been spent, and the Reconstruction Agency estimates that an additional ¥6.5 trillion ($65 billion) will be needed to complete the work planned for the second five years of Tohoku's recovery (Reconstruction Agency, Government of Japan 2016a). The Reconstruction Agency's priorities are to complete housing reconstruction; help ensure business recovery so that more people do not move away to Tokyo and elsewhere in search of employment; and provide for the physical and mental health of disaster victims, especially the elderly. The act authoriz-

In December, fishing industry families gathered to celebrate the launch of a rebuilt fishing boat in Minami Sanriku, Japan. All along the Tohoku coast, aquaculture, ports, fishing fleets, and fish processing facilities were destroyed by the 2011 tsunami. Photo by Laurie Johnson (2013).

ing the Reconstruction Agency sets a sunset date of October 2020, and for now, the national government remains committed to completing the recovery efforts in Iwate and Miyagi prefectures by that date. The recovery in Fukushima Prefecture will take much longer, however, and the governance mechanism and the long-term commitment to work on the nuclear incident remain unclear.

LESSONS

In three of Japan's most significant earthquake disasters, the primary mechanisms for targeting national-government funds to disaster-affected communities have been national land use planning programs primarily designed for nondisaster situations, such as land readjustment, redevelopment, and collective relocation. These programs have traditionally been used to create more rational land use patterns, construct roads and urban infrastructure, and promote economic development. Therefore, their application in post-disaster recovery has emphasized infrastructure rebuilding and economic stabilization first, ahead of housing and social recovery. Use of these programs as the primary mechanism for community recovery has also led to large-scale replacement and rebuilding, rather than repair of damaged structures. The emphasis on reconstruction creates new, safer buildings and infrastructure, but it also causes significant physical changes to the urban environment. Furthermore, in the case of Kobe, if substantial repair assistance had been available early in the recovery, housing recovery in many areas might have proceeded more rapidly and at less cost.

These programs are also challenging to implement after a disaster for several reasons. They require consensus from all property rights holders, which can entail lengthy negotiations and can be especially difficult when rights holders have been displaced by the disaster. Consensus is also difficult to sustain in the face of adversity and especially in post-disaster recovery. Many health, financial, and political pressures can undermine and erode multiparty agreements over time, and implementation takes a long time. Furthermore, the emphasis on existing land use programs means

that, at least initially, the government neglects other aspects of recovery. Once the major physical planning programs, such as land readjustment, are under way, the government identifies remaining recovery gaps and fills them, but in an ad hoc manner.

Japan's disaster management and policy framework, like that of many other countries, emphasizes a tiered and shared governance arrangement in which local governments are primarily responsible for post-disaster response and recovery. However, Japan's strongly centralized governance structure in non-disaster times operates in post-disaster recovery situations as well, particularly in the areas of policy and finance. Japan also has a locally led and decentralized approach to disaster management. Only recently has a national disaster management agency been established in the Cabinet Office; however, its main responsibilities are planning, preparedness, and, to a lesser extent, emergency response. There is no permanent, centralized agency or framework for post-disaster recovery, and, as these disasters have shown, new institutional arrangements have had to be made to manage large-scale disasters, each of which has involved complex, multilevel governmental collaborations in which the national government maintains strong control over public policy and finances.

Recovery after the 1923 Tokyo, 1995 Kobe, and 2011 Tohoku earthquakes all required both significant amounts of national-government resources, especially money, and technical and legislative assistance. The national government's governance approach to the reconstruction after the 2011 disaster is in many ways a hybrid of the 1923 and 1995 approaches. The national Reconstruction Agency has a minister of reconstruction who reports directly to the prime minister, and it manages the overall recovery budget, from which it can distribute funds either to various national ministries or directly to local governments. In this way, the Reconstruction Agency has considerable authority to cut across traditionally rigid and separate agency structures and programs and provide a more integrated bundling of programs and services to disaster-affected communities. But establishing this new institution and the recovery program has taken time, and these delays have caused considerable criticism and frustration. Because of reforms made by the Abe administration in 2013 to accelerate

the recovery and provide a more holistic and integrated solution for affected communities, the Reconstruction Agency anticipates that most of the nationally funded recovery projects will be completed by March 2019.

As previously noted, the scale and complexity of the 2011 disaster, the vast number and varying governance capacity of the more than 200 affected local governments, and the multiprefectural governance arrangements were all factors that were considered in determining the Reconstruction Agency's authorities and design. Across Tohoku, a fairly rural region, governance sophistication and capacity are not comparable to those in Tokyo, Kobe, or other large metropolitan areas. Furthermore, the Tohoku region was already struggling with long-term population and economic decline before the disaster. The significant loss of local leaders and staff in the disaster and the long-term post-disaster population displacements have further complicated and limited local governance capacity for recovery in the region. Therefore, it is still unclear whether there is a need for such a centralized and nationalized approach to recovery in future large-scale disasters.

After the 1995 earthquake, local leaders made a convincing case to the national government that responsibility for both recovery planning and implementation had to reside with local governments in the Kansai region. Kobe, Hyogo Prefecture, and even the smaller cities had sophisticated staff, experienced in working with national-government ministries and the national planning and building regulations, such as land readjustment and redevelopment, which would serve as the mechanisms for providing national-government funding for recovery. These staff persons also built long-term relationships. Thus, national-government leaders could feel more confident that their funding would be well managed.

In 1995, the Kobe earthquake's occurrence on January 17, only two months before the start of a new fiscal year on April 1, significantly influenced the planning process. It rushed planning decisions that might otherwise have involved more citizen input. The necessity of submitting special budget requests to the national government for assistance with reconstruction projects before March 31, and the end of the fiscal year, drove most of

the decision making during the two months of first-phase planning. This, in turn, conditioned the more detailed decisions made with the help of *machizukuri* organizations in the second planning phase. It also created tension with citizens and likely gave rise to a greater level of citizen organization and participation in post-disaster decision making that has carried over to more recent disasters. Both local and national leaders in Japan are more accepting of the *machizukuri* process and the critically important role that these organizations have played in reestablishing community fabric after disasters. Furthermore, *machi-kyo* meetings provide a focus for households forced to temporarily live elsewhere in the region.

Last, the national government's policy responses to the March 2011 disaster are a sharp departure from traditional Japanese government stances on local government and individual responsibility in disaster recovery. For the first time, local governments in the Tohoku region do not have to share in recovery program costs for land readjustment, collective relocation, and other programs administered by the Reconstruction Agency. As already noted, many of these local governments were already struggling before the disaster, but so have other Japanese cities after disasters. It has taken Kobe nearly 20 years to pay back its debt burden for rebuilding after the 1995 earthquake. Some worry that a lack of financial responsibility in disasters will translate into a reduced local stake in the recovery plans and the process in the Tohoku region.

Similarly, compensation of victims for home rebuilding, long-term displacement, and unemployment after the March 2011 disaster signals a fairly significant departure from prior national policy on self-responsibility in post-disaster recovery. After the 1995 earthquake and other disasters, a substantial burden was placed on individuals to finance their recovery. Residents had to combine resources or rebuild smaller spaces in order to finance reconstruction and depleted their savings in the process, with long-term economic effects. Some residents could not afford to rebuild or buy replacement structures in their former neighborhoods and were permanently displaced. There were also many hidden long-term costs, including tax deferrals and bond payments, which ultimately have affected local finances and individual taxpayers.

It is still too soon to fully evaluate the results of these policy changes in the Tohoku region or their long-term influence on Japan's overall policy and approach to disaster management. It may be that a costly precedent has now been set without full consideration of the tremendous financial burden this will place on the national government and citizens nationwide when the inevitable Tokyo earthquake, the Nankai-Tonankai-Tokai mega-earthquake and tsunami,[13] or some other major metropolitan-area disaster occurs.

NOTES

1. Following individual field investigations in the months after the January 17, 1995, earthquake in Kobe, the authors began collaborating with colleague, Ken Topping, on a long-term comparative study of rebuilding following the 1994 Northridge, California, and 1995 Kobe earthquakes. They received funding for the study from the National Science Foundation, and collaborated with Murosaki Yoshiteru and Ohnishi Kazuyoshi of Kobe University; Koura Hisako of Osaka University; and planning consultant Kobayashi Ikuo. In subsequent years, the authors also received research support from Kyoto University and Tohoku University and have collaborated with Hayashi Haruo and Maki Norio of Kyoto University and Iuchi Kanako and Liz Maly of Tohoku University on the study of recovery following the 1995 and 2011 earthquakes.
2. The first step of the land readjustment process is to notify property owners and develop an acceptable concept plan, decided by the local government, for the layout of streets and parks. The second step is to determine the boundaries of public facilities and the percentage of land per parcel given to public improvements, as well as the amount of reserve land. Each person's property is reduced in size by the same rate. When the local government approves the public facilities plan, a board that includes owners and specialists is created to supervise the delineation of new lot lines (replotting). Construction of roads and utilities can begin at this point. When all the owners in a block agree, the temporary replotting is complete, and they can rebuild. If the board approves the replotting, it becomes official, even if some owners are opposed. Once all blocks are complete, final replotting legally completes the land readjustment project, and the implementing agency goes through a process to ensure that the value of each parcel is at least the same as before. If the final value is less than the pre-readjustment value, the implementing body subsidizes the difference.
3. The concept of a home ministry was introduced during the Meiji period (1968–1912) to provide centralized oversight of prefectural and local governments

(Sorensen 2002). After World War II, the ministry became the Ministry of Construction, and now part of the Ministry of Land, Infrastructure, Transport, and Tourism (MLIT).

4. ¥ = Japanese yen. In 1923, the currency conversion rate was about US$1 = ¥2; thus, about US$20 million of the nearly US$120 million of donations (in 1923 dollars) was used for this purpose. This would be about $278 million of the $1.667 billion in donations (in 2015 dollars), using a 2015 currency conversion rate of US$1 = ¥122.
5. An average 1995 currency conversion rate of US$1 = ¥100 is used for the financial data related to the Kobe earthquake.
6. At the time, only 7.2 percent of Japanese households had earthquake insurance, and the rate was much lower in Kobe, about 3 percent (Evans 2001). Some of the reported residential insurance payouts were for fire-related damage caused by the earthquake.
7. The secretary is the second-level administrative person after the vice minister; the minister is a political appointee.
8. Three types of rights are involved in this system: (A) the land property right held by the owner of the land; (B) the land use right held by the owner of the building (who may rent the land); and (C) the inhabitant right held by the occupant (either owner or renter) of the building.
9. Landowners who could not rebuild individually because of nonconforming lot-size and street-width situations under the Building Standards Law were often able to join with adjacent owners to build joint housing projects and receive some government financial assistance for design and common-area costs. The City of Kobe's comprehensive bonus system allowed building owners to add floor area, and hence value, in return for providing accessible open space; it was applied in many older, densely developed neighborhoods. Cooperative housing combined several parcels into one building site and relaxed the building side-yard setback restrictions to provide for rebuilding at the property boundary, effectively creating row housing. Collective housing featured clusters of units with common meeting, kitchen, and bathroom areas and provided a more affordable housing alternative for residents with special needs, particularly single elderly persons.
10. Under this law, unit owners have title to their individual units, plus a share of total floor area for the project. They do not necessarily own the land. Unit rental occupants have no rights in this decision process.
11. The currency exchange rate between the Japanese yen (¥) and the U.S. dollar fluctuated considerably between the start of 2011 and the end of 2016. An average valuation of US$1 = ¥100 is used for financial data related to the 2011 disaster.
12. Cleanup of the power plant is the responsibility of Tokyo Electric Power Company and the Ministry of International Trade and Industry. The Ministry of the Environment is responsible for cleanup of private land, and victim compensation is being led by the Ministry of Education, Culture, Sports, Science, and Technology (Okamoto 2014).

13. Offshore subduction zone earthquakes in the Tokai-Tonankai-Nankai region will be accompanied by a massive tsunami, similar to the one that struck in the Tohoku region in 2011. However, a major Tokai-Tonankai-Nankai earthquake and tsunami will affect the most densely populated and economically critical corridor of Japan, running from the Osaka-Kansai region eastward to Tokyo, and could result in more than 300,000 deaths (*Asahi Shimbun* 2012).

5 India

State-Managed Recovery with NGO Involvement

Long-term recovery policies in India have developed primarily at the state level, first in the state of Maharashtra after the 1993 Latur earthquake and most fully in the state of Gujarat after its enormous 2001 earthquake. Recovery after both the 1993 and 2001 earthquakes emphasized housing reconstruction, and both states implemented innovative owner-driven methods that were organized at the highest levels. A significant innovation in Gujarat was a partnership between the state government and nongovernmental organization (NGO) networks; this model was subsequently used on a smaller scale in Tamil Nadu after the tsunami. In addition to a variety of secondary sources, this chapter is based on field visits by Olshansky over a decade of collaboration with Indian colleagues.[1]

PRE-DISASTER INSTITUTIONAL AND POLICY SETTING

India has a federal system of government. Disaster response is the responsibility of state governments, but the government of India provides financial support for post-disaster relief (Vatsa 2002). At the time of the 2001 Gujarat earthquake, the government of India had a very small natural disaster management division in the Ministry of Agriculture that provided disaster assistance to states when needed. The location of this administrative agency illustrates that emergency management in India traditionally involved responding to crop damages from floods or drought. The earliest

governmental involvement in disaster relief grew out of the great famine of 1876–1878, in which 5.25 million people died. Because of the focus on famine and public health issues, neither disaster mitigation nor reconstruction was mentioned in the constitution or national policies (Chandrasekhar 2010). After the 1993 Latur earthquake and the 1999 Orissa cyclone, the Indian government began to change its approach to disaster preparedness. By 2001, the government of India had established the Crisis Management Group in the cabinet, as well as the Natural Calamity Fund to help support state governments. Changes in the government's approach continued after the 2001 earthquake (Chandrasekhar 2010). But none of the new initiatives addressed the processes of recovery and rehabilitation or how they could be used to reduce disaster risks.

THE 2001 GUJARAT EARTHQUAKE

Earthquake Damage

On January 26, 2001, a magnitude 7.7 earthquake struck wide areas of the state of Gujarat and particularly devastated the urbanized areas of Bhuj, Gandhidham, Anjar, Bhachau, and Rapar (Murty et al. 2005). In Bhuj, for example, almost 6,500 buildings collapsed, half the buildings and infrastructure inside its walled city were damaged, and 7,000 people died. This was the deadliest earthquake to strike India since 1935, and it was "the first major earthquake to hit an urban area of India in the last 50 years" (Jain et al. 2002, 2). The devastation of Bhuj "was unprecedented in the history of urban India" (Balachandran 2010, 160). The earthquake affected 21 of the 25 districts of Gujarat, killed 13,805 people, and damaged over 1.1 million homes up to 400 km from the epicenter (Murty et al. 2005). According to the State of Gujarat, 233,660 houses were completely destroyed (GSDMA 2002). The most affected area was Kutch District, where approximately 70 percent of the buildings were destroyed and 89 percent of the earthquake fatalities occurred.[2] The old central areas of the cities, most notably the walled city of Bhuj, were especially affected.

The earthquake caused widespread damage to essential infrastructure and public services. Over 5,000 health facilities and 12,000 schools were

The January 2001 earthquake was the deadliest to strike India since 1935, and the scale of urban devastation, shown here in the city of Bhuj, was unprecedented in modern Indian history. *Source*: Photograph taken by team members of Environmental Planning Collaborative, Ahmedabad, during the preparation of Development Plan for Bhuj in 2001. Reprinted with permission.

damaged or destroyed, and government buildings, along with their official records and government employees, were severely affected. The earthquake devastated urban and rural water systems—over 240 small earthen dams were damaged—roads, power systems, and telecommunications, and thousands of small businesses were destroyed or damaged (Murty et al. 2005; World Bank and Asian Development Bank 2001).

Direct damage to assets was initially estimated at Rs. 9,900 crore ($2.1 billion), and the cost of rebuilding to higher disaster-resistance standards was estimated at Rs. 10,600 crore ($2.3 billion) (World Bank and Asian Development Bank 2001). About half of these costs were due to housing damage. Although the loss of economic output was only about 2 to 3 percent of Gujarat's gross domestic product, the earthquake was devastating to com-

munities in the affected area, and it harmed the livelihoods of 19,000 handicraft artisans and several thousand salt farmers; in addition, about 20,000 cattle died (World Bank and Asian Development Bank 2001).

Gujarat is one of the wealthier Indian states—third in per capita income, and a leader in manufacturing and trade—but the area affected by the earthquake has high levels of poverty and a high proportion of "scheduled caste"[3] residents, who tend to be segregated (World Bank and Asian Development Bank 2001). Most of Kutch is a sparsely populated, arid region that relies on labor-intensive agriculture, salt mining along the coast, handicrafts, and trade. Only 31 percent of the population lived in urban areas at the time of the earthquake; the largest urban centers were Bhuj (121,000), Gandhidam (104,000), and Anjar (51,000).

The Initial Governmental Response

Immediately after the earthquake, numerous countries sent rescue and medical teams and relief supplies (Vatsa 2002). Because of the unprecedented scale of the disaster, the government of Gujarat was initially overwhelmed. The UN immediately sent a team from the Office for the Coordination of Humanitarian Affairs (UNOCHA), and a UN disaster management team, along with UN Development Programme (UNDP) staff, established an on-site operations coordination Center at the District Collector's Office in Bhuj to coordinate UN activities (World Bank and Asian Development Bank 2001).[4] Many international NGOs also were involved in relief efforts.

ORGANIZING FOR RECOVERY

The Gujarat State Disaster Management Authority

Approximately two weeks after the earthquake, on February 8, 2001, the state of Gujarat established the Gujarat State Disaster Management Authority (GSDMA), a cabinet-level agency headed by the chief minister of Gujarat and tasked with planning and implementing response and recovery. The GSDMA was also asked to lead the state in developing an emergency

management system for future events (Thiruppugazh and Kumar 2010). It was modeled on the Orissa State Disaster Mitigation Authority, which had been created after a 1999 cyclone in Orissa (Murty et al. 2005). The first task of the GSDMA was to develop policies for post-earthquake reconstruction. Because the GSDMA is a cabinet-level agency, its decisions carry the authority of the chief minister; therefore, it is difficult for other departments to decline to cooperate (Thiruppugazh 2007).

One reason for establishing the GSDMA was to have an independent agency free of normal government procedures (Thiruppugazh 2007). Another was to create a single entity to receive international funds, thus providing assurance that the funds would not be diverted to non-disaster purposes. Finally, the GSDMA played an important coordination role as the agency whose sole responsibility was implementing reconstruction while interacting with over 20 state-government departments, as well as the government of India, international funding agencies, UN agencies, and NGOs.

The GSDMA planned, coordinated, and monitored work by several implementing agencies that provided goods and services (GSDMA, n.d.). Because the GSDMA received funds from international agencies, as well as from the government of Gujarat, it created a standardized financial management system with offices in over 150 locations in the affected area and quarterly audits by an independent auditor (GSDMA, n.d.). One way the GSDMA monitored recovery progress was through continuous social impact assessment, contracted through a local university. This process helped the GSDMA identify issues and address them in a timely manner.

The GSDMA was assisted by an advisory committee made up of prominent citizens, representatives of NGOs, and technical experts (Thiruppugazh 2007). In addition, a central implementation review group, with members from various line agencies and major stakeholder groups, periodically reviewed recovery progress (GSDMA, n.d.). A variety of technical consultants also assisted the GSDMA. For example, the GSDMA engaged the National Council for Cement and Building Materials, the Central Building Research Institute, and the Indian Institute of Technology, Bombay, to oversee the technical audit of housing construction and issue completion certificates (GSDMA, n.d.; Murty et al. 2005).

In 2003, the Gujarat State Disaster Management Act established the GSDMA as a permanent body consisting of 14 specified ministers and state officers, with the chief minister as chairperson, and described the broad responsibilities of the GSDMA, other government departments, district collectors, local authorities, and local community organizations (Government of Gujarat 2003). This was the first such act for an Indian state and was seen as a model for others to follow (Murty et al. 2005).

As of 2005, the GSDMA was managing the recovery and disaster management activities with a staff of 63 agency employees, assisted by staff from line departments with relevant responsibilities; in addition, many government employees at district, *taluka*, and village levels had responsibilities that were primarily oriented toward disaster recovery in the years after the earthquake (Murty et al. 2005).[5] The core of the permanent agency consists of about 20 officers from the Indian Administrative Services; many services are delegated to other agencies or contracted out to the private sector (GSDMA, n.d.). In short, the GSDMA created policy, designed programs, monitored progress, and coordinated the substantive work of other organizations. Because of its status in representing the chief minister, it had the authority to coordinate the activities of state agencies.

Reconstruction Programs

Despite the unprecedented and widespread damage, the government of Gujarat managed to conceptualize and initiate a comprehensive strategy in just three months (Balachandran 2010). The recovery process was designed to include the following major elements: housing, livelihoods, infrastructure, social infrastructure, community participation, and disaster management capacity building (Murty et al. 2005). Within weeks after the earthquake, the state, supported by the World Bank, determined that a decentralized process of owner-driven housing in situ would be the most effective and fastest means of reconstruction (Thiruppugazh and Kumar 2010). The government intended that communities and households would lead the reconstruction, and that the government and NGOs would provide technical support (Murty et al. 2005). Immediate assistance to support the

livelihoods of vulnerable households, such as cash-for-work programs for debris removal, was also an early priority (World Bank and Asian Development Bank 2001).

Within a month, the government of Gujarat conducted an initial damage assessment, and three weeks after the earthquake, it announced a set of four rehabilitation and reconstruction policy packages:[6]

(a) Grant assistance—for land, housing, and public facilities—"for relocation of 256 villages where more than 70 percent of the housing stock" was destroyed;
(b) "*in situ* reconstruction or repairs of housing in villages and towns located in areas declared as the worst affected" in seismic hazard zones IV and V;[7]
(c) "*in situ* construction for destroyed or damaged housing in the less affected" seismic zone III; and
(d) "a package of grant-based compensation in urban areas" which eventually provided funds for residents of damaged/collapsed high-rise buildings to repair or rebuild. (World Bank and Asian Development Bank 2001, 31–32; Gupta et al. 2002)

A special fifth package was still to be developed for the four badly affected urban areas in Kutch district: Anjar, Bhachau, Bhuj, and Rapar.

Within the first year, the government of Gujarat and the government of India, with assistance from the World Bank and the Asian Development Bank, developed a more complete three-stage reconstruction:

- Immediate phase (phase I), over two years, for "immediate housing reconstruction needs, and laying the groundwork for establishing a sustainable disaster management capacity in the state";
- Medium term phase (phase II), over three years, to reconstruct "public infrastructure, assist in social capital restoration and take the next step in establishing disaster management capability, by building a professional emergency preparedness and response system"; and
- Long term phase (phase III), over 5 years, for "the long term institutionalization of comprehensive disaster management planning as part of

> Gujarat's overall development process," including "hazard mitigation, knowledge management and risk transfer." (GSDMA 2002, 3)

The early emphasis was on housing reconstruction, with public services and emergency preparedness capacity building to come later. The immediate phase began in March 2001 with the reallocation of $400 million previously awarded from the World Bank now to be used for reconstruction of housing and schools, emergency repairs to water tanks and roads, and repair of public buildings (GSDMA 2002). The government of Gujarat later developed the comprehensive Gujarat Emergency Earthquake Reconstruction Project, under which a variety of donors covered damages beyond housing (World Bank 2009). For example, the Asian Development Bank, the European Commission, The Netherlands and other countries, and numerous NGOs conducted other recovery projects for health and educational facilities and infrastructure (GSDMA 2002).

Restoration

Village organizations completed debris removal by March 2002, with compensation from the government of Gujarat. The government constructed temporary shelters in the four main urban areas in Kutch and distributed materials for shelter construction elsewhere. According to the GSDMA, all 256,369 families who needed temporary shelter were provided with accommodation. Minor repairs of nearly 1,800 public buildings were complete by March 2002, but major repairs of public buildings and cultural properties took longer (GSDMA 2002). Infrastructure repairs were seen as an opportunity to update and improve many community and regional infrastructure systems (Murty et al. 2005).

NOTABLE RECOVERY FEATURES

Nongovernmental Organizations

Gujarat had a strong NGO network at the time of the earthquake, and these NGOs played key roles in immediately helping restore livelihoods

(World Bank and Asian Development Bank 2001). As of November 2001, about 63 NGOs already were active in 211 villages, and they had memorandums of understanding (MOUs) in place for building over 32,000 houses (Gupta et al. 2002).

Kutch Nav Nirman Abhiyan (hereafter Abhiyan), a local network of 29 NGOs, coordinated NGO activities and established 25 local subcenters (*setu*s) to coordinate assistance and information, with formal endorsement and support by the government (Abhiyan and UNDP 2001). Abhiyan had grown out of experiences from the 1998 Kandla cyclone in Gujarat, after which several NGOs realized that they could be more effective if they worked collectively (Murty et al. 2005). After the Gujarat earthquake, the setu centers served 400 villages spread over 10 talukas. During the relief phase, the setus set up local resident committees to ensure that the relief was effective and fair, and in the recovery phase, they took on a variety of roles: information centers, communication between the government and the public, bridges between villages and implementing organizations, a governance level between villages and talukas, monitoring of construction materials, technical support and training for the community-based reconstruction, legal assistance, and monitoring of health issues (Abhiyan and UNDP 2001). Through frequent reports from the setus, Abhiyan was able to synthesize the needs assessments produced by the NGOs in all the villages, as well as to provide periodic updates of temporary housing needs; this information helped identify service gaps and prioritize subsequent activities by the government and NGOs. Setus were also valuable locally as neutral sources of information (Murty et al. 2005).

NGOs were also involved in housing reconstruction. Eighty NGOs conducted reconstruction and rehabilitation work in 280 villages, built over 41,000 houses and associated infrastructure, and reconstructed school and healthcare buildings (GSDMA, n.d.). An interested NGO would apply to the GSDMA and district authorities to adopt a village. After government approval, the NGO would then obtain the consent of the village *gram sabha* (all the adult members of a village) (GSDMA, n.d.). The GSDMA coordinated and monitored all NGOs involved in reconstruction.

Housing for Owners

Money was provided for housing reconstruction through two options: an owner-driven plan and a public-private partnership plan (Murty et al. 2005). In both cases, the government funded construction only of the core house; any additions were the responsibility of the owner. The emphasis on owner-driven reconstruction as the preferred mode was profound and unprecedented. It had rarely been used as a housing method in India, and it certainly had never been applied on such a large scale (Thiruppugazh 2007).

In the owner-driven plan, chosen by about 82 percent of affected households, funding was provided directly to owners to rebuild on-site, either by themselves or through contractors (Murty et al. 2005). The amount of assistance depended on the seismic zone, the type of house, and the local cost of construction. The government disbursed the funds directly to owners' bank accounts in three stages: 40 percent as an advance, 40 percent after completion and inspection of the plinth, and 20 percent after the certificate of completion. In order to accomplish this, the government needed to help residents open bank accounts, which were new to most of them. It achieved the opening of 660,000 bank accounts in four months (Thiruppugazh 2011).

Despite the success of the owner-driven approach, 16,000 houses were not completed, either because they were never started after owners received the first installment, or because owners stopped construction after receiving the second installment (Thiruppugazh 2011). In many cases, this was due to personal hardships, such as needing to spend the first installment on medical expenses or on restarting livelihoods. In Bhuj, it was estimated that 20 to 25 percent of owners spent the first installment and could not continue reconstruction without additional assistance; in the urban areas, there were fewer NGOs to provide supplementary financial and technical assistance (Murty et al. 2005).

The public-private plan—typically, but not always, for village relocation—involved 50-50 funding by the government and NGOs, which were also encouraged to rebuild public infrastructure (Murty et al. 2005). The government paid the NGO, and NGO engineers supervised the construction.

Owner-driven reconstruction helped foster construction quality because the owners could monitor the process, which decreased the likelihood of poor construction practices. The process also served to educate owners about practices of earthquake-resistant construction and their importance. One result, documented by a survey of 500 owner-added extensions to homes in Bhachau, was that 45 percent of the additions to owner-driven houses had seismic features, whereas only 8 percent of the additions to NGO-built houses had such features (Thiruppugazh 2011). Owner-driven reconstruction also was a success in terms of household satisfaction and cost. A study four years after the earthquake confirmed that for owner-driven reconstruction, 94.5 percent of households were fully satisfied with the location, size, and quality of their home (Barenstein 2006). In contrast, the contractor-driven approaches were much less popular: 71.8 percent of households were satisfied with in situ reconstruction, and only 22.8 percent were satisfied with relocation (problems included construction quality and lack of participation); the last approach was also by far the most expensive (Barenstein 2006).

To ensure transparency, lists of beneficiaries and assistance provided were displayed in the villages and were publicly available in local government offices and on the GSDMA website (GSDMA, n.d.). Reportedly, 93 percent of villages complied with the requirement to publish the list of beneficiaries (World Bank 2009). Another successful means of providing a voice to beneficiaries was a grievance procedure, which received 40,000 claims.

By mid-2003, just two and a half years after the earthquake, 97 percent of damaged homes in villages had been repaired, and 87 percent of completely destroyed houses had been reconstructed (Murty et al. 2005). Eventually, over 911,000 houses were repaired, and over 201,000 were reconstructed (GSDMA 2006).

Mukherji (2008) argues that the process could have been even more effective if it had proceeded at a more deliberate pace. She claims that the pressure for speed was based more on the interests of the World Bank to stick to its established project schedule and on the interests of Gujarat to meet the World Bank's deadlines than it was on meeting the actual housing needs of the residents. Sanderson and Sharma (2008) note that this was

The municipality of Bhachau is pictured here 10 years after it was devastated by the 2001 earthquake. Photo by Robert Olshansky (2011).

a particular problem with NGO-built housing, which was designed more to meet the needs of NGOs to show quick results than it was to meet the needs of residents. Lower-income homeowners had difficulty making the first housing payment. Furthermore, the bank's schedule did not adequately recognize that urban areas would need to complete urban planning before being able to build housing. The result was that the state government rushed the urban planning processes to meet the World Bank's deadlines. Also, the housing program and the planning processes were out of sync: urban homeowners received their first installment long before they could get permission to rebuild. According to Mukherji, the World Bank wanted the government to disburse the money quickly so that it would not divert it to other purposes, but the result was that homeowners diverted it for other purposes.

Housing for Renters

The government's initial housing assistance packages were for owners and did not directly address the problems of renters. The government provided reconstruction funds to the owners of rental buildings, but some owners who lived far away did not use the government funds they received to rebuild rental housing (Murty et al. 2005). In many cases, owners of rental properties were glad to lose their rent-controlled units, where long-term occupants were paying rents below current market rates, so they could use their land for more profitable purposes (Mukherji 2010). Some NGOs stepped in to build ownership housing for former renters on relocation sites, and Bhuj subsequently initiated some programs to help settle former renters in these locations (Murty et al. 2005). Mukherji (2010), in a study of housing recovery in Bhachau, shows how renters' needs were overlooked.

Housing Relocation

All reconstruction decisions emphasized community participation. According to the GSDMA, the "Village Gram Sabha which consists of all the adult members in the village has been given the complete power to decide about the relocation or *in situ* reconstruction of a village" (GSDMA 2002, 16). The government relied on the setus as communication links with the villages, and it established grievance processes to ensure that the needs of women, scheduled castes, and other vulnerable groups were met.

Although relocation was a major topic shortly after the earthquake—according to a variety of accounts, the government had initially assumed that all villages with more than 70 percent damage would relocate, with the help of NGOs—it became apparent that this would be needed only for some of the worst-affected urban areas. The relocation approach was based on the policy of Maharashtra after the 1993 Latur earthquake, but most towns in Gujarat strongly resisted it (Barenstein 2006). The World Bank, which ultimately provided most of the funding for the reconstruction program, also resisted relocation.

Some villages, however, voluntarily chose to relocate. If at least 50 percent of the households chose to relocate, the government allowed them to move to

the new site; the remainder could rebuild in situ either through an NGO or on their own (GSDMA, n.d.). Ultimately, of 484 earthquake-affected villages, 24 villages (5,720 houses) were fully relocated to a new site, and 37 villages (10,014 houses) were partially relocated (Murty et al. 2005).

Most relocated villages were built on government land, either entirely by NGOs or through 50-50 partnerships of NGOs and the government (GSDMA 2002). The latter were funded by an Asian Development Bank (ADB) housing loan. Some relocated villages were already under construction in March 2002.

Relocation had some advantages for residents (Murty et al. 2005). Relocation housing was of high quality and was constructed by contractors to higher seismic standards. Relocated villages also had new infrastructure and community centers. Although owners had to surrender title to their original land, in most cases their new land was larger. The disadvantage was that relocation involved moving to a new location and a housing configuration that differed from the traditional cluster (*fadia*) system of the older villages. In some cases, relocation disrupted livelihoods. Relocations took a bit longer than on-site reconstruction, but as of March 2004, 15,734 houses had been rebuilt at relocation sites, representing 96 percent of planned relocation housing (Murty et al. 2005).

Reconstruction of Urban Areas

Because the four urban areas—Bhuj, Bhachau, Anjar, and Rapar—would require considerable infrastructure investments in addition to reconstruction of housing, the government of Gujarat decided to develop individual planning studies before making reconstruction decisions (Murty et al. 2005). After consultation with international agencies and local institutions, the Gujarat Urban Development Department in May 2001 announced a framework for urban reconstruction, which constituted the fifth earthquake rehabilitation package:

- The "government created Area Development Authorities (ADAs) in Bhuj, Bhachau, Anjar, and Rapar under the provisions of the Gujarat Town Planning and Urban Development Act, 1976."

- "The government negotiated a Rs 500-crore loan [about $110 million] from the Asian Development Bank (ADB) to fund urban reconstruction."
- "The government designated the Gujarat Urban Development Company Limited (GUDC) as the implementing agency for the project. The GUDC is a Special Purpose Vehicle established by the government (before the earthquake) for conceptualising and implementing urban development projects."
- "To support the ADAs and GUDC, the government decided to hire consultants to carry out town and infrastructure planning, and to scrutinise applications for building permissions." (Balachandran 2010, 163)

The GUDC was the key to success because it was a preexisting agency with experienced professionals, and because it was given considerable autonomy. Completion of a citywide development plan normally takes two years, but the plans for the four cities, which were more detailed and included more public involvement than any other plans in India, were completed in six months, from initial data collection in May to final approval in December (Balachandran 2010). The Gujarat Town and Urban Development Act of 1976 specifies a two-step process: publication of a land use development plan and formulation of town planning schemes (detailed implementation plans for specific sites) (Gupta et al. 2002).

Because most of the earthquake deaths occurred in the dense centers of Bhuj, Anjar, and Bhachau, which had old buildings of poor construction and congested access, the urban-area plans emphasized safety improvements (Gupta et al. 2002). Some features of these reconstruction projects were road widening to improve access, provision of open spaces, relocation of some public places to reduce congestion, and extension of infrastructure to include adjacent areas. The government restricted building heights to two stories in the Kutch region to facilitate improved construction standards (Balachandran 2010). Although damaged houses could be repaired, reconstruction of collapsed houses in the four towns could begin only after approval of the development plans.

Bhuj, the largest city in the region, was particularly hard hit, and in the immediate aftermath of the earthquake, its future was uncertain. Ideas

The old town of the historic city of Bhuj was rebuilt after the devastating Gujarat earthquake in 2001. Photo by Robert Olshansky (2011).

ranged from total relocation to complete reconstruction in situ; turning the old city into an earthquake museum was also seriously considered (Balachandran 2010). Because the old walled city was historically and culturally significant, public sentiment strongly favored rebuilding it while preserving as many of the old buildings as possible. After considering all the options, the government included the rebuilding of Bhuj—which involved a combination of reconstruction, redevelopment, and relocation—in the urban reconstruction package released in May 2001. Before the earthquake, 35,000 people—one-fourth of the city's population—lived in the 1 km^2 area of the walled city, and the other 90,000 Bhuj residents were spread over 20 km^2. The planning concept involved restriction of heights and floor area, which would cause the city to further expand laterally, and an offer of parcels in tentatively proposed relocation areas for households and businesses that wanted to leave the city center.

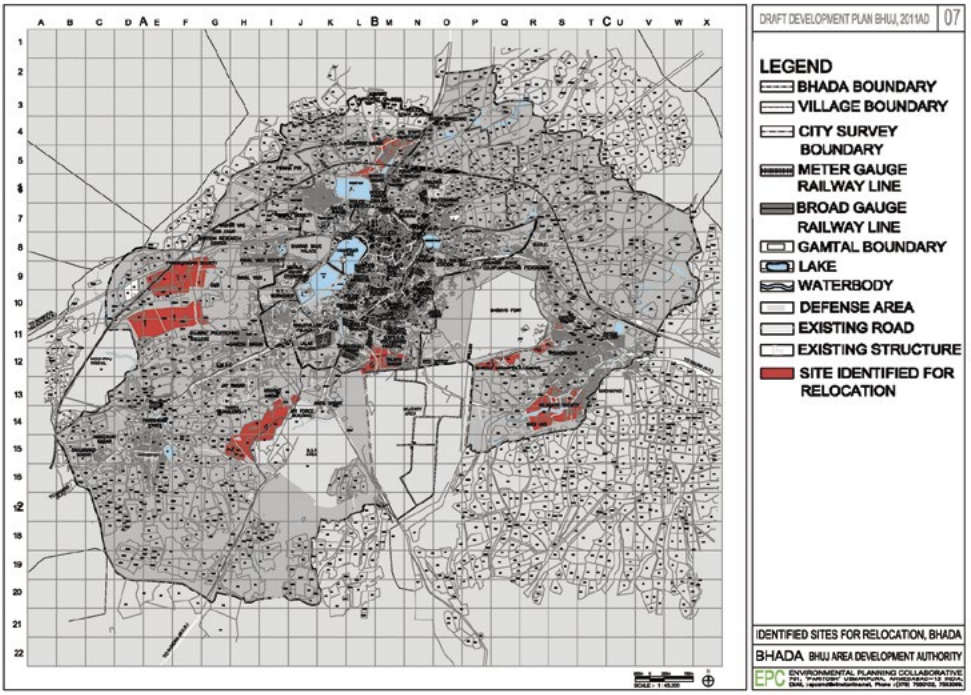
Private planning consultants, some of whom had already been working informally in the affected areas, were hired to do the plans for Bhuj and Bhachau; a team of seven planners in the Gujarat State Planning Department drew up the plan for Anjar (Murty et al. 2005). Because the state of Gujarat provided both consultants and area development authorities (ADAs), the municipal planning agencies were able to continue with their normal work.

The consultants for the Bhuj ADA began work in May 2001, gathering data for a planning area of 56 km^2 that could provide for the expansion of Bhuj; the last previous plan had been prepared in 1976.[8] The work included land suitability analysis, demographic and market studies, an assessment of infrastructure, and a detailed topographic and cadastral survey. Reconciling the maps with the land records was particularly time consuming. The plan was a pioneer in India in several ways: in addition to planning for land use regulation and infrastructure layout, it addressed strategic planning for the overall physical and economic development of the city, and it also catalyzed a heritage protection effort. Despite this comprehensive approach, in the end, the government placed the highest priority on rapid construction of public infrastructure.

Public involvement was extensive, including a survey of 2,500 households and several hundred commercial establishments and two rounds of stakeholder consultations: the first round with opinion leaders and key stakeholder groups, and the second round through a series of public meetings, concluding with an invitational citywide workshop. From this process, two problems emerged: a wide range of public opinions concerning reconstruction and a lack of strong local leadership.

The conceptual development plan, based on stakeholder meetings, was presented to public meetings in July and August 2001, and the draft development plan was published in September for two months of public comment. The plan was finalized in December 2001 and immediately approved by the state government.

Staffing in this tight time frame was a challenge. The Bhuj Area Development Authority (BHADA) was initially made up of staff drawn temporarily from other state agencies. Consultants were hired to review building applications. It took until October 2001 for BHADA to establish offices, hire permanent staff, and acquire equipment, and a full-time director did



This map shows the plan for housing relocation areas on the outskirts of Bhuj. Plan prepared by team members of Environmental Planning Collaborative, Ahmedabad, during the preparation of Development Plan for Bhuj in 2001. Reprinted with permission.

not arrive until April 2002. Thus, during the creation of the plan in 2001, the consultants took the lead, and BHADA was barely visible.

The draft development plan proposed seven possible relocation sites, primarily ones where existing government land was available. By October 2001, BHADA took ownership of the sites, and it completed preliminary layouts by December. Residents could then apply for these lots. Various complications, however, delayed the allocation of the relocation lots; as a result, some people who might have relocated instead opted to stay in the walled city.

Because the high density of unsafe buildings in the city centers had caused many deaths in the earthquake, and the debris-filled narrow streets had impeded emergency access, the plan aimed at creating more open spaces and easing accessibility. At the same time, however, street realignment

and open spaces would erase much of the town's character. Because widening the existing street network would have meant wide-scale destruction of existing buildings, planners decided instead to improve layouts and create new streets, using now-vacant plots of land where buildings had collapsed. Owners gave up some of their land, proportional to the size of their lots, so that streets could be widened in these areas. This was similar to the land readjustment process used in Kobe, Japan, after the 1995 earthquake. Thus, households and shops did not need to be permanently displaced from the old city.

Introduction of the town planning scheme was a pathbreaking planning decision because "urban renewal in such a complex situation had never been attempted before in India" (Balachandran 2010, 185). What was "perhaps the most complex physical planning exercise ever attempted in India" (186) involved over 12,000 plots involving ownership claims by over 30,000 people, and it was done under the time pressures of post-disaster recovery,

The plan was first proposed in July 2001, and the government took three months to approve it. But a new Gujarat chief minister took office in October 2001, and the new government did not approve the scheme until November 2002.

The first stage consisted of a draft plan that allowed the transfer of roads and public spaces to BHADA. The second stage involved negotiation of final plot boundaries, facilitated by a town planning officer. The third stage consisted of implementation on the ground and resolution of financial issues. This process began in February 2002, and the plan was finalized in February 2003. The process was complicated by the need to resurvey much of the area. Eight draft schemes were presented to the public at over 20 meetings let by BHADA and the consultants. An NGO, the Bhuj Development Council, helped by establishing offices in each scheme area, where it displayed plans and solicited comments; some neighborhoods also established committees. The state finalized and approved the draft schemes in August. The speed of the process presented many challenges: building demolition and debris clearance were occurring simultaneously, BHADA staff were working at the same time on the relocation sites, and government decisions sometimes overturned policies—such as

Above is the plan for land readjustment in the old city center of Bhuj. Original plot boundaries are in green, final plot boundaries are in red, and new streets are gray. The shaded areas show where buildings survived the earthquake. *Source*: Team members of Environmental Planning Collaborative, Ahmedabad, during the preparation of Town Planning Schemes for Bhuj in 2001. Reprinted with permission.

those that defined the amount of public open space—that stakeholders had already agreed on.

Final layouts were presented to the BHADA board in January 2003, and the process of transferring the final plots was carried out in February and March 2003. This process, too, faced problems resulting from pressure from the government to complete it as early as possible. The hearing process "became somewhat a formality and got wrapped up in the shortest possible time" (Balachandran 2010, 195). Serious errors in the final plot allocations sometimes created inaccessible plots and led to months of hardships and delays for many owners.

Infrastructure construction in the walled city was difficult because existing infrastructure systems were still in use, and many occupied structures stood in the way of construction. Once the road system was approved in mid-2002, design began, and all infrastructure networks were complete by late 2004, nearly four years after the earthquake.

In 2004, a sewer line was laid in Saraf Bazaar in the heart of the old city of Bhuj as part of the land-readjustment process. *Source*: Photograph by B. R. Balachandran, Environmental Planning Collaborative, Ahmedabad, during the preparation and implementation of Town Planning Schemes for Bhuj in the period from 2001 to 2004. Reprinted with permission.

At several points in the process, progress depended on the capabilities, dedication, and leadership of a lead planner or engineer with energy and vision, such as the chief town planner at BHADA. Conversely, frequent changes of personnel in key administrative leadership positions significantly slowed the process.[9] In mid-2003, a dynamic district collector took over, who sped up the reconstruction process and brought about amenities such as streetscaping, public space, and reconstruction of town gates.

Bhuj today is a city that has benefited from public investments that far exceeded anything done in the past, and it is now better configured to accommodate future growth. Although the old center is less dense, it is still a vibrant urban area and is safer than before. In addition, earthquake-resistant construction practices have become ingrained in the building culture.

Livelihood Programs and Economic Development

Livelihood programs helped people restart their businesses, including over 70,000 artisan businesses, 183,793 farming units, 18,284 industrial units, and 13,373 women's businesses (GSDMA 2006). For artisans and masons, the government provided over 50,000 tool kits, 3,400 looms, 16,000 loans and subsidies, and marketing assistance. The government also helped small businesses and industries, giving subsidies to over 13,000 small shops, and helped over 46,000 farmers rehabilitate farm structures and over 78,000 farmers repair their irrigation systems.

It developed a strategy to stabilize the cost of building materials by distributing cement at subsidized prices through 1,082 material banks and providing tax exemptions to manufacturers in Kutch (Thiruppugazh 2011). These policies served to stabilize prices, maintain the supply of raw materials when demand was high, and increase employment in Kutch.

Seismic Safety, Public Facility Improvements, and Emergency Management

The post-earthquake reconstruction process provided the opportunity to improve seismic safety of buildings, as well as governmental emergency management practices. The process involved training of engineers, educational programs, construction of public facilities, and new emergency

management procedures and policies. Over 1,600 trained engineers helped ensure implementation of earthquake resistance; over 29,000 masons and 6,200 engineers were trained in hazard-resistant construction (GSDMA 2006). This required considerable organization; the government created an engineering division and trained deputy engineers to inspect each building before release of second and third payments (Thiruppugazh 2011). The GSDMA also "carried out a massive public-information campaign using pamphlets, films, folk dances, buses, street plays, posters, exhibitions, student competitions, radio jingles, and even jokes to convince people in some 3,000 villages to use earthquake-resistant reconstruction" (Thiruppugazh 2011, 76–77). Thus, owner-driven reconstruction as carried out in Gujarat demanded an enormous investment of money, labor, and technical resources by the state.

Some opportunities to improve building quality were lost because of the urgency of reconstruction. Paradoxically, trying to go too fast may have impeded early success (Murty et al. 2005). But construction compliance improved over time as masons, engineers, and technical staff received training and became more familiar with the program (World Bank 2009). Not all the long-term risk-reduction strategies were as successful as hoped. Certifying masons did not work as well as expected because of a lack of long-term commitment by everyone involved (Thiruppugazh 2011). Powell (2011), in a study of a small sample in 2010, also expressed some concerns about long-term disaster risk-reduction knowledge and practices of homeowners who had participated in the owner-driven reconstruction.

In addition to the improved seismic safety of new and retrofitted buildings, post-earthquake reconstruction brought other significant improvements that would not have occurred otherwise: improvements to rural and urban infrastructure, regional economic development initiatives, a new culture of disaster risk reduction, and, for many, a sense of empowerment (Thiruppugazh 2007). Improvements to the port, roads, and regional infrastructure helped better position the region for economic growth (Gupta et al. 2002).

Healthcare facilities were reconstructed with seismic and wind resistance; 430 buildings were completed (GSDMA, n.d.). While all schools stayed in operation in tents and temporary structures, the government re-

paired 42,678 damaged schoolrooms, reconstructed 8,812 destroyed schoolrooms, and built 3,938 new rooms, all with hazard resistance. The collapsed hospital in Bhuj was reconstructed with an earthquake-resistant base-isolation foundation funded by the Prime Minister's Office at a cost of Rs. 100,000,000 (about $2 million).

By 2006, Gujarat had made considerable progress in improving emergency management practices. Disaster management plans were prepared for the state, all 25 districts, 10,375 villages, 97 urban local bodies, and 144 talukas (GSDMA 2006; World Bank 2009). The Gujarat Institute of Disaster Management and the Institute of Seismological Research had been established. Furthermore, the *Gujarat Hazard Risk and Vulnerability Atlas* was released in 2006, and enactment of the Gujarat Professional Civil Engineer's Bill, 2006, raised standards of structural design practice. At the community level, in association with the UNDP, the Community Based Disaster Management Program was initiated in 4,000 villages to develop preparedness plans and building capacity at all administrative levels, with a special focus on women.

The Gujarat experience also led to changes at the national level. For example, in July 2002, the Ministry of Home Affairs shifted from its previous emphasis on disaster response and initiated the Disaster Risk Management Program and the Urban Earthquake Vulnerability Reduction Program (Murty et al. 2005). The national and state governments began numerous other initiatives to improve the capacity of India to manage natural hazards. In 2005, a few months after the Indian Ocean tsunami struck India, the National Disaster Management Act was passed, which established the National Disaster Management Authority to coordinate national disaster management activities and the National Institute of Disaster Management to train government staff (Thiruppugazh 2007). This act created a three-tiered institutional framework at national, state, and district levels (Chandrasekhar 2010).

Financing

Gujarat had intended from the outset to finance a massive reconstruction program on its own, but the availability of World Bank and ADB funds

TABLE 5.1 Recovery Funding

Organization	Type of Funding	Amount in Rs. Crore (US$ in Millions)
Government of Gujarat	Grant	2,603 (578)
Government of India	Grant	490 (109)
World Bank	Loan	3,044 (675)
Asian Development Bank	Loan	1,697 (377)
European Commission	Grant	172 (38)
The Netherlands	Grant	170 (38)
Others (NGOs, other governments)	Grant	320 (70)
TOTAL		**8,496 (1,885)**

Source: Murty et al. 2005, 10, table 2.1.

provided the state with the additional resources it needed to expand reconstruction to include new infrastructure, retrofitting of undamaged public buildings, and a disaster risk-reduction program (Thiruppugazh 2007). The cost for phase I, including housing, social sectors, infrastructure, community participation, and capacity building, totaled $473.9 million, of which the World Bank provided $400 million, and the state government provided the balance (Gupta et al. 2002). The World Bank also provided funding for the Gujarat Emergency Earthquake Reconstruction Project, which would extend the phase I work (World Bank 2009). Table 5.1 displays total recovery funding as of 2005. This was considerably less than the initial cost estimates. Initially, the government of Gujarat had a calamity relief fund of Rs. 892 crore (Rs. 8,920,000,000, or about $200 million) (Gupta et al. 2002). In addition, because of the severity of the disaster, the state had access to the National Calamity Contingency Fund; Gujarat received installments of Rs. 500 crore (about $110 million) and Rs. 330 crore (about $73 million) from this fund. After an additional assessment, the government of India advanced an additional Rs. 637 crore (about $141 million).

THE 1993 LATUR EARTHQUAKE

Recoveries after disasters that occurred in India in 1993 and 2004 provide context for understanding the significance of India's approach to recovery

after the 2001 Gujarat earthquake. The roots of India's post-2001 policy changes can be attributed to the actions of the state of Maharashtra after the 1993 Latur earthquake, which provided the testing ground for community-based reconstruction, as well as some important lessons regarding community relocation. The recovery from the 2004 tsunami provided the first test of some of India's new disaster policies after the Gujarat earthquake.

The magnitude 6.4 Latur earthquake struck a rural part of the state of Maharashtra on September 30, 1993, killing over 8,000 people, completely destroying 67 villages, and leaving over a million people homeless (Nikolic-Brzev et al. ca. 1999). Although Maharashtra is an industrialized state, the area struck by the earthquake was an underdeveloped agricultural area with high illiteracy rates and had been the target of development initiatives to reduce disparities between it and the rest of the state.

The Maharashtra Emergency Earthquake Rehabilitation Project

Within one week of the earthquake, the government of Maharashtra signed an MOU with the World Bank for a reconstruction program that emphasized the improvement of infrastructure and housing, including earthquake-resistant construction. The World Bank also required full participation of the affected population, which had never been done on this scale in India (Jigyasu 2002).

The total cost of what was officially titled the Maharashtra Emergency Earthquake Rehabilitation Project (MEERP) was $350 million, of which the World Bank provided $246 million as a credit to the government of Maharashtra (Nikolic-Brzev et al. ca. 1999).[10] The housing component accounted for 58 percent of the cost and involved (1) relocation of 52 villages; (2) complete reconstruction in place of another 22 villages; and (3) reconstruction, repair, and strengthening of housing in over 2,400 villages. The other components of the MEERP included infrastructure, economic and social rehabilitation, technical assistance, and development of a disaster management plan.

The MEERP had a three-tier management structure, created in December 1993 (Nikolic-Brzev et al. ca. 1999). At the top, a cabinet subcommittee, chaired by the chief minister, was responsible for overall policy. The

second level was a steering committee called the Central Implementation Group, composed of all secretaries of the state. At the third level, implementation was led by the Project Management Unit (PMU), headed by the secretary and special commissioner of earthquake relief and rehabilitation and staffed with experienced administrators and technical professionals from the government of Maharashtra, assisted by a variety of consultants. The PMU had full administrative and financial authority over the project, as well as the power to coordinate and supervise the work of other agencies and hire consultants and contractors.

The district collector was the agent of the PMU at the district level, assisted by an additional collector who worked full-time on the MEERP. Field engineer teams also worked at the district level. At the peak of construction, 173 state engineers were working in the two districts, assisted by an additional 700 contract engineers (Nikolic-Brzev et al. ca. 1999). Villages had village-level committees for communication and dispute resolution; these were most active in relocated villages.

Village Relocations

The decision to relocate the most damaged villages (more than 70 percent of housing uninhabitable) was based on the cost of debris removal, the opportunity to develop well-planned villages without caste segregation, and the feeling of residents that the old sites were uninhabitable (Nikolic-Brzev et al. ca. 1999). According to Nikolic-Brzev et al., the impetus for relocation came from the residents: villagers strongly demanded the relocations, and the government decided that it would be too difficult to persuade them otherwise.[11] In the end, "a comprehensive survey of every beneficiary in the relocation villages found a high level of satisfaction with the new houses" (Nikolic-Brzev et al. ca. 1999, 17). In a survey of 23,498 beneficiaries, 77 percent of respondents said that the design of the new village was better than that of the old one. Notably, however, beneficiaries in relocated villages were not as confident about the seismic resistance of the construction as were beneficiaries who were directly involved in the repairs.

In contrast, Salazar claims that the relocation plan was proposed by the government, and that it "was met with months of opposition by NGOs"

(Salazar ca. 2001, 6). He observes that the early wave of NGOs, quickly building concrete and steel housing, caught the attention of villagers who perceived that these modern buildings must be safer than the stone buildings that had collapsed (Salazar 1999). He also cites a 1998 Ahmedabad Study Action Group report that describes limited participation by beneficiaries, inappropriate design of the new houses, and construction deficiencies, all common problems with relocation housing.

It should be noted that post-disaster village relocation has been a controversial issue in all the Indian disaster cases described in this chapter. It is difficult at this point to evaluate the relocations in Maharashtra, but they were obviously contentious at the time. Rebuilding relocation villages took longer than rebuilding in place, residents did not gain the same empowerment benefits as did those involved in reconstruction in situ, and they were not as confident about the safety of the new buildings; however, reportedly, they were satisfied with their new villages. Eight years later, given this experience, Gujarat considered and then rejected both village relocation and contractor-led reconstruction. In Tamil Nadu after the 2004 tsunami, because of the spatial dimensions of the tsunami and the coastal zone regulations, relocation was again used, as was contractor-led reconstruction, and, in retrospect, both of these appear to have been problematic.

Most (19,513) of the relocation houses in Maharashtra were constructed under the supervision of the government, and NGOs and donor agencies constructed the other 8,406, typically in the smaller villages, usually initiating their work before the World Bank program began (Nikolic-Brzev et al. ca. 1999). Once the World Bank funding arrived, the government typically retained the NGOs as contractors.

Land acquisition, which took approximately one year, slowed relocation. According to Vatsa (2001), the relocation process took five years, in part because of World Bank and government insistence on public involvement and review of plans, which were often contentious and lacked consensus; some of the earlier, NGO-initiated villages were built more quickly, without such involvement.

For village layout and plot allocation, the PMU hired community-participation consultants. The involvement of owners in the repair process

was highly innovative and served to educate them about earthquake-resistant building methods (Nikolic-Brzev et al. ca. 1999).

The Reconstruction, Repair, and Strengthening Programme

The Reconstruction, Repair, and Strengthening Programme (RRSP) repaired or rebuilt 189,000 houses in 2,400 villages. Beneficiaries received a fixed amount of financial assistance, according to two levels of damage (Nikolic-Brzev et al. ca. 1999). The government provided training for the beneficiaries, local masons, and engineers who provided technical assistance. The junior engineers played a key role as the face of the program in the villages (Nikolic-Brzev et al. ca. 1999). Each one was assigned to one or more villages, and they lived in or near to the villages where they worked. They provided technical assistance to individual beneficiaries, helping them make reconstruction choices. They also held training sessions for local masons and acted as intermediaries between the villages and the government.

The government took care to develop procedures for the disbursement of benefits, both cash and building materials, in order to make sure that they were used for reconstruction (Nikolic-Brzev et al. ca. 1999). Payments were made in three installments: 20 percent deposited into the beneficiary's bank account upon initial approval, 70 percent (a mixture of cash and of coupons for cement and steel) upon preparation of the construction site, and 10 percent upon construction up to the lintel level.

The program also included a full-time quality-control and technical auditing team, which commissioned several studies of program performance and participant satisfaction. A survey of RRSP program beneficiaries found that 95 percent were satisfied overall with the construction or repair work, and 93 percent believed that the result was earthquake resistant (Nikolic-Brzev et al. ca. 1999).

Another major innovation of the program was its emphasis on empowering women, which had lasting effects (Nikolic-Brzev et al. ca. 1999). Furthermore, the community-based organizations assisting the villages worked not only on reconstruction but also on other development issues, which helped the government's larger goals of improving the area's standard of living.[12]

THE 2004 TSUNAMI IN TAMIL NADU

The great Sumatra earthquake of December 26, 2004, produced a tsunami that affected the coastline of the Indian Ocean far from the earthquake's epicenter. The tsunami hit 2,260 km of coastline of mainland India, primarily in the state of Tamil Nadu, but also in the union territory of Pondicherry and the states of Kerala and Andhra Pradesh (Murty et al. 2006). Maximum tsunami run-up heights ranged up to a maximum of 12 meters in Nagapattinam, where the tsunami also inundated areas up to 3 kilometers inland as it washed away houses, damaged harbors and bridges, and inundated farmland (Maheshwari, Sharma, and Narayan 2006).

The death toll in India was 12,405, and over 235,000 houses were destroyed (Government of India 2005).[13] The tsunami inundated over 200 km^2 of agricultural land with salt water. Most of the losses were concentrated in Tamil Nadu, where 470,000 people were displaced. The hardest-hit district was Nagapattinam, where over 6,000 lives were lost, 196,000 people were displaced, and over 28,000 were housed in relief camps (Prater et al. 2006). Fishing communities lost both their homes near the ocean and their fishing boats and nets, on which their livelihoods depend.

The government of Tamil Nadu acted quickly and cleared all the debris within five days (Murty et al. 2006). On December 31, the state government asked three prominent NGOs—the South Indian Federation of Fishermen Societies from Trivandrum, Nav Nirman Abhiyan from Bhuj, and Action for Community Organisation, Rehabilitation and Development (ACCORD) from Nilgiris—to set up an NGO coordination center outside the district collector's office in Nagapattinam. This facilitated the matching of community needs with NGO capabilities, and eventually 419 NGOs were involved in Nagapattinam (Prater et al. 2006). This coordination center, the first of its kind after a disaster in India, was enormously helpful in assessing needs and coordinating the provision and distribution of relief material.

On December 28, the chief minister of Tamil Nadu announced a relief package that included compensation of Rs. 100,000 ($2,200) to the family of every deceased person, as well as promises of shelter (Prater et al. 2006). The government also immediately announced an assistance package to

restore livelihoods, offering to replace 30,000 gill nets, 10,000 motorized boats, and 20,000 wooden boats (Murty et al. 2006).

The government of India received aid offers from over 700 international NGOs for relief and rehabilitation (Chandrasekhar 2010). At the request of the government of India, the ADB, the United Nations, and the World Bank conducted an initial damage and loss assessment in early February 2005 (Asian Development Bank, United Nations, and World Bank 2005). In addition to numerous national and international NGOs, the UN, through UNICEF as its lead agency to coordinate relief, expanded existing programs in India.

The government did not ask for any immediate relief assistance from multilateral agencies, but it did seek assistance for long-term rehabilitation and reconstruction, primarily for livelihoods, housing, and infrastructure (Government of India 2005). It received $528.5 million from the World Bank, $200 million from the ADB, $30 million from the International Fund for Agricultural Development, and $7.5 million from the Japan Fund routed through the World Bank.

In June 2005, the government of India announced its intent to take the "opportunity to put in place a level of infrastructure and services in the affected areas of a level which would be far higher than that destroyed by the Tsunami" (Government of India 2005, 7). The government established the Core Group on Reconstruction, Management, and Monitoring for Tsunami Affected Areas in the Planning Commission, which, by June, had developed a plan for rehabilitation and construction to be implemented over three years, ending in March 2008. Infrastructure redevelopment was led by the district administrations, along with village governments, and was funded by the World Bank's Emergency Tsunami Reconstruction Project, as well as the Asian Development Bank's Tsunami Emergency Assistance Project (Chandrasekhar 2010). Agriculture rehabilitation consisted of provision of materials, such as gypsum and seeds, by the state and district administrations and of technical assistance by NGOs for land remediation.

For permanent housing, the state and district governments initially considered providing money, rather than constructed housing, directly to homeowners, but this was rejected after it became apparent that many residents had used previous relief funds to purchase alcohol (Chandrasekhar 2010).

When it became clear early on that NGOs had sufficient capacity to provide for initial housing needs, the state government decided to reduce its initial role and participate only where communities were underserved by NGOs. The government of Tamil Nadu issued a set of government orders (GOs) to guide NGO activities in recovery for various sectors, such as housing, infrastructure, and agriculture (Chandrasekhar 2010). The GOs described needed actions, actors, funding, and standards. NGOs invited to participate signed an MOU defining state and NGO responsibilities. The district administration allocated NGOs to villages, and the state government set standards for housing construction, infrastructure, and land acquisition. Under existing coastal zone regulations, no houses were allowed within 200 meters of the high-tide line; all owners in this zone, regardless of damage, would be given a free home in a location farther inland.[14] Owners could rebuild in situ in the coastal zone but would receive no assistance. The district administration selected relocation sites in consultation with leaders of each village.

According to the Tamil Nadu government, as of July 31, 2009, out of the planned 19,736 houses for phase I in the Nagapattinam district, 18,333 had been constructed, and virtually all of them had been turned over to their new owners; NGOs had built 17,701 of them (Chandrasekhar 2010). Few of those owners who were required to relocate, however, had moved out of their old homes as of April 2008. The reasons for this included the need for fishing households to stay close to the sea, poor construction quality, incomplete infrastructure in the new location, and fear that once they vacated the coastal location, the state would encourage new resort developments that would limit their access to the sea.

In contrast to the generally positive housing reconstruction experience in Gujarat, as well as post-tsunami experiences in Indonesia, Tamil Nadu chose not to use an owner-driven model of housing reconstruction. The reasons for this, expressed by various parties, included governmental mistrust of the skills and commitment of local residents, fears that the men would squander the money on alcohol, widespread availability of international NGOs willing to donate housing, governmental dislike of traditional housing types, lack of government will to take effective control and make people full partners, and a lack of governmental capacity to manage an owner-driven process effectively (Barenstein 2008; Chandrasekhar 2011).

Despite memories of the 2004 tsunami, fishermen and their families in Nagapattinam, Tamil Nadu, were reluctant to move too far from the source of their livelihood, the beach, where they kept their boats and nets and dried their catch. Photo by Robert Olshansky (2008).

Although the contractor-driven model initially promised rapid reconstruction, it resulted in a slow process; furthermore, partly because of the initial fast pace of the process, it lacked sufficient public involvement to ensure widespread user satisfaction with the results (Chandrasekhar 2010). In retrospect, this model probably was not the most effective choice. According to Barenstein, an owner-driven model could have been quicker and more effective and would also have been well suited to local conditions: "Indeed, local communities had a strong housing culture and building capacity, the local construction industry was not affected by the tsunami, construction materials and skilled labour were locally available, and the number of houses that needed replacement was significantly below the official estimates" (Barenstein 2008, 9). Furthermore, the policy goal of replacing most houses with hazard-resistant designs may not have been appropriate. Traditional

houses were safe and well adapted to the local climate. It is unclear how much of an improvement the new houses represented.

A positive institutional aspect of the recovery was the creation of the Tamil Nadu Tsunami Resource Center (TNTRC) in August 2005 as a joint initiative of the government of Tamil Nadu, the UNDP, UNICEF, and international NGOs, including Oxfam, World Vision, Christian Aid, Caritas India, Save the Children, and Catholic Relief Services (United Nations Team for Recovery Support 2006). The TNTRC helped coordinate recovery activities, maintained databases of projects and resource providers, and monitored progress and was connected to district-level resource centers, such as the NGO Coordination and Resource Center (NCRC) in Nagapattinam (United Nations Team for Recovery Support 2006). The NCRC was also an innovation that helped affected villages network. Notably, it was created by staff experienced in working with Abhiyan in Bhuj (George 2008). After beginning as a means of coordinating relief activities, it evolved into a recovery organization and subsequently into a permanent organization called Building and Enabling Disaster Resilience of Coastal Communities (*www.bedroc.in*). Both the TNTRC and the NCRC were well respected by a broad range of stakeholders, were accepted and supported by the state and district governments, and provided effective bridges between villages, NGOs, and multiple levels of government.

LESSONS

India experienced a series of major disasters over a little more than a decade, from 1993 to 2004. These events catalyzed the rapid development of an emergency management system at both the national and the state level. There have been no major events since 2004, however, that would test this system.

Owner-Driven Housing Reconstruction

The 1993 Latur earthquake introduced the innovation of owner-driven housing reconstruction and repair. Although this did not cover all housing

reconstruction, owners successfully rehabilitated thousands of houses, and much was learned in the process.

After the 2001 earthquake in Gujarat, the state government boldly committed to supporting owner-driven housing reconstruction. The GSDMA supported the reconstruction of over 200,000 housing units and the repair of over 900,000. In most cases, owners were actively involved, which was a considerable achievement. Over 70 percent of all repair and reconstruction work was completed within two years of the earthquake (Barenstein 2006). Approximately 87 percent of destroyed homes were rebuilt by their owners in "the biggest housing reconstruction programme ever undertaken, both in terms of the number of houses and geographic area. The Gujarat experience was also the first time in history that owner-driven reconstruction was facilitated by a government through financial, material and technical assistance on such a large scale" (Barenstein 2006, 5). Public involvement after the Gujarat earthquake went beyond owner-driven housing reconstruction to include community decisions about relocation, the public consultation processes in the urban area plans, and the advocacy and networking work of NGOs.

Tamil Nadu, in contrast, three years later shied away from the commitment of staff and organizational effort needed to support owner-driven reconstruction, unlike Indonesia, which has embraced the idea of community-based reconstruction, including community infrastructure planning. There is consistent evidence of the effectiveness of this approach, but it requires commitment, staff, and information infrastructure.

The Role of NGOs in Reconstruction

Another innovation introduced in Gujarat was the partnership between the state government and NGO networks. This official recognition helped create broad-based, self-organized networks of stakeholders, such as the setus, that accomplished more than the government alone could have done. Pioneered by Abhiyan in Gujarat, this idea spread to both the state and district levels, with the TNTRC and the NCRC in Tamil Nadu State and in Nagapattinam District. Such organizations increase the collective effectiveness of NGOs in serving community recovery needs.

High-Level Management Structures

India's experience also demonstrates the usefulness of high-level management structures to facilitate recovery. Organizations such as the GSDMA in Gujarat and the PMU in Maharashtra were linked to the highest state-level executive, so they could require the cooperation of all other state agencies. Such a streamlined system, however, risks emphasizing speed to the detriment of meaningful community involvement. To accomplish community involvement in such circumstances, the recovery organizations in Gujarat and Maharashtra created a network of committed agents and advocates as part of the system at the local level. They also built periodic monitoring, auditing, and social welfare surveys into their programs.

The Pros and Cons of Speed

By March 2006, five years after the Gujarat earthquake, virtually all the reconstruction goals had been accomplished, and considerable progress had been made on improving the emergency management capability of Gujarat at a variety of levels. To some degree, however, the speed of reconstruction impeded resident participation (Murty et al. 2005). In addition, some researchers have observed that the initial negotiation of the rehabilitation packages by government officials and international agencies could have benefited from stakeholder input before the packages were finalized. To some degree, the pressure for speed may have been artificial, based more on the needs of the World Bank than on meeting resident housing needs (Mukherji 2008)

Still, by all accounts, the recovery process after the 2001 Gujarat earthquake was a remarkable achievement (e.g., Murty et al. 2005), and most observers agree that the positives far outweigh the negatives (Sharma 2009). It was "perhaps the largest rehabilitation project ever undertaken in the country, either as a part of disaster management or otherwise" (Gupta et al. 2002, 125).

Urban Versus Rural Reconstruction

Rural reconstruction, which was carried out via decentralized means, used owner-driven reconstruction of houses, and relied heavily on NGOs to facilitate responses to other needs, could occur rapidly, but urban reconstruction was more complex. It required planning to ensure smart investment in infrastructure and appropriate coordination between infrastructure and new land uses, as well as collective decisions regarding land use location and intensity, infrastructure location and quality, and relocation. Although urban reconstruction took longer than its rural counterpart, the planning, redevelopment, and relocation processes were still completed remarkably swiftly. Nevertheless, despite abundant data and considerable public involvement, haste meant that not all the results were optimal. There were winners and losers at the end of the reconstruction.

Bhuj was reconstructed after a comprehensive planning and land-readjustment process. Although the old center is now less dense, it is still a vibrant urban area. Photo by Robert Olshansky (2011).

Improvements in Disaster Management

Reconstruction from the Gujarat earthquake has resulted in improved seismic safety of buildings, more reliable infrastructure, and a new culture of disaster risk reduction. The national government, as well, now has a National Disaster Management Authority, created in 2005. The positive lessons learned from Gujarat also have influenced disaster recovery processes in other places. In the words of the World Bank, "The projects approach to the reconstruction of housing (the homeowner based approach, the cash grant transfer process, the damage assessment, the grievance redressal process, the third part audits) are now standard across South Asia disaster management housing reconstruction programs and has influenced housing reconstruction in Aceh, Indonesia" (World Bank 2009, 18).

NOTES

1. In Gujarat, Venkatachalam Thiruppugazh (GSDMA) and B. R. Balachandran were generous hosts and provided Olshansky with original sources on the rebuilding of Gujarat state and Bhuj, respectively. This chapter also benefited from field research conducted by Illinois doctoral student Divya Chandrasekhar on the recovery of Nagapattinam, Tamil Nadu, following the 2004 tsunami. Some of the travel was supported by the University of Illinois Research Board.
2. Writers spell the name of this district in various ways; a common spelling is *Khachchh*. This chapter adopts the spelling *Kutch*, which state and district government websites use.
3. "Scheduled caste" is the official term for the lowest caste in India, commonly called "untouchables."
4. In India, the district is an important subdivision of the state. It is led by a deputy commissioner, or collector, who is appointed by the state governor (an appointee of the national government) (Chandrasekhar 2010). In colonial times, the district collector was responsible primarily for collecting revenue. After independence, collectors were recruited through the Indian Administrative Service, and they now manage most state-funded development schemes. The district administration can be involved in rural development, public works, social welfare, public health, education, police, forestry, agriculture, fisheries, and land development.
5. A taluka is an administrative grouping of several villages.
6. Mukherji (2008) describes the political economy of the reconstruction packages. The government needed to rebuild housing quickly in order to satisfy its middle-class constituency. It also had long wanted to develop Kutch to attract industry, but because of Kutch's small population, it never could justify the large infrastructure

investments that would be needed. The earthquake provided a reason to improve roads and ports, as the government had long wanted to do. The party in power in Gujarat at the time was the same as that in national power, so it was able to persuade the national government to request a sizable loan from the World Bank. India had previously avoided international aid but had recently changed its policy as a result of the 1993 Latur earthquake. According to Mukherji, India requested the loan even before providing the loss-assessment and rehabilitation package.

7. These are the seismic hazard zones from the 1998 Seismic Zoning Map of India. Zone V is the highest and stands for "very high" damage risk; zone IV is "high"; and zone III is "moderate." The area with the highest damage was in zone V, and Ahmedabad is in zone III (World Bank and Asian Development Bank 2001, 8).
8. This account of the planning process in Bhuj is based entirely on Balachandran (2010).
9. This was a problem in Gujarat in general, where there were frequent changes of senior staff, such as the Kutch district collector, and GSDMA staff had multiple administrative assignments (Murty et al. 2005) In addition, because of the political importance of the Bhuj recovery, the state government exercised close control over the Bhuj authority and changed the CEO whenever political priorities changed (four times between October 2001 and August 2003) (Mukherji 2008).
10. Details regarding the MEERP can be found at *http://mdmu.maharashtra.gov.in/pages/meerp/index.htm*.
11. Vatsa supports this claim with evidence of a government survey, as well as accounts of local village governments, rightly or wrongly, asking for relocation. "When a local Panchayat (Village Council) asks for relocation, supported by a plenary village meeting, is it not a representative demand through a legitimate democratic process?" (Vatsa 2001, 4). "The fact remained that the villagers were unwilling to live on the old site. They were completely against the use of stones in their walls. They wanted new and planned settlements. Relocation therefore emerged as the most feasible alternative" (Vatsa 2001, 12).
12. Jigyasu (2002), however, questions the sustainability of the mason training now that the engineers and training centers no longer exist.
13. Of the deaths, 107 were in Andhra Pradesh, 177 in Kerala, 8,009 in Tamil Nadu, 599 in Pondicherry, and 3,513 in the Andaman and Nicobar Islands, according to the Prime Minister's Office (Government of India 2005).
14. Owners of houses between 200 and 500 meters from the high-tide line could choose between a free new house in place or farther inland; owners of partially damaged *pucca* (concrete) homes would receive a grant for repairs only (Chandrasekhar 2010). Beyond 500 meters from the high-tide line, owners of damaged houses had the same benefits as owners of houses between 200 meters and 500 meters from the line, but they would not need to relocate.

6 Indonesia

Centrally Managed, Community-Driven Approaches to Reconstruction

The Indonesian archipelago consists of 17,000 islands, one-third of which are inhabited, stretching for over 5,000 km from Aceh in the west to Papua in the east, all within a highly seismically active region. Indonesia is subject to a variety of natural hazards, including earthquakes, volcanic eruptions, tropical cyclones, and frequent floods and landslides. Because of nearby large offshore faults, the area is highly prone to tsunamis. A sequence of huge disasters, beginning with the 2004 Indian Ocean tsunami, led Indonesia to quickly develop highly effective recovery management organizations and innovative, community-driven planning and implementation practices. This chapter presents a series of accounts of Indonesia's experiences with post-disaster recovery. In addition to a variety of secondary sources, this chapter is based on two extended field visits by Olshansky and several years of collaboration with Indonesian colleagues.[1]

PRE-DISASTER INSTITUTIONAL AND POLICY SETTING

Despite Indonesia's hazardous location, during 54 years of independence before 2004, it experienced no great natural disasters. Only four events during that time caused more than 1,000 fatalities; the deadliest was a 1992 earthquake that killed 4,944 (BNPB 2012). Thus, Indonesia's experience had been with localized disasters, and governmental policies emphasized short-term response. In 1966, under Presidential Decree 256, Indonesia

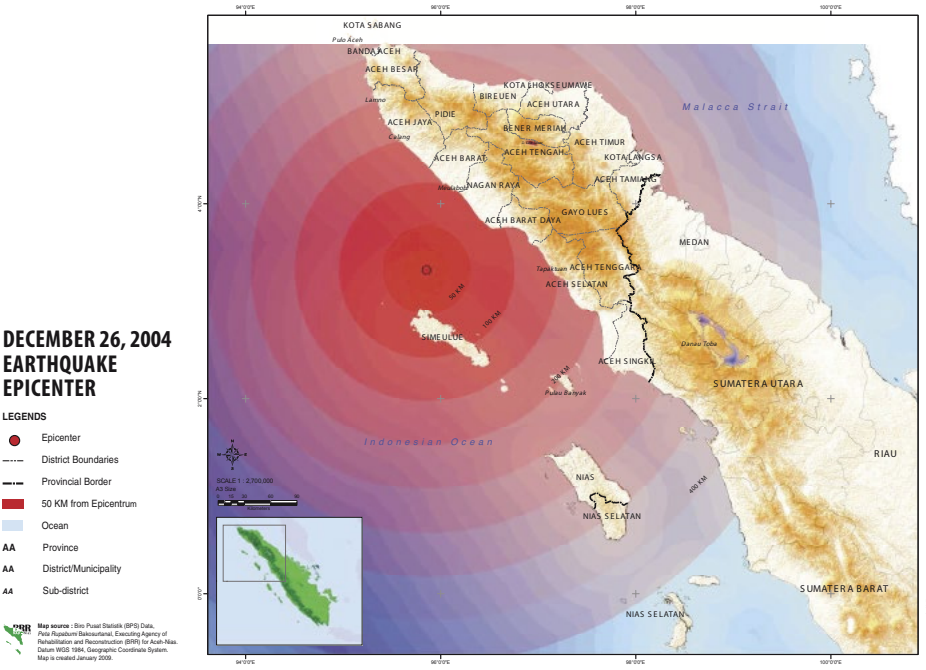
established the Natural Disaster Management Advisory Center, which, for the first time, emphasized relief from natural disasters rather than from wars (Pacific Disaster Management Information Platform 2012). Beginning in 1979, the National Coordinating Agency for Disaster Management (Bakornas PB) coordinated disaster response, recovery, and preparedness activities (Bappenas 2005). In 2001, it became the National Coordinating Agency for Disaster and Refugee Management (Bakornas PBP), which was the organization that existed at the time of the 2004 tsunami.

Bakornas PBP coordinated the work of existing ministries rather than leading operations itself. Chaired by the vice president and under the coordinating minister of people's welfare, it had a core staff of about 40 people in 2004 (Bappenas et al. 2006), but it mostly relied on its member line ministries—Home Affairs, Social Affairs, Health, Settlement and Regional Infrastructure, Communications, and the chief commander of the armed forces and police—for implementation. Because of all the different ministries, the reporting lines were sometimes unclear in an emergency (UNDP and BNPB 2009). Bakornas controlled a limited budget of its own; each member line ministry had a contingency budget that the Ministry of Finance could release when needed. Bakornas had little authority over spending decisions after disasters.

THE 2004 SUMATRA EARTHQUAKE AND TSUNAMI

The 2004 great Sumatra-Andaman earthquake, which struck on December 26, 2004, was one of the largest earthquakes ever recorded, with a magnitude of 9.1 to 9.3 (Kanamori 2006). It also generated the most devastating tsunami, in terms of loss of human life, in recorded history. Northwestern Sumatra, including the city of Banda Aceh, about 250 km from the epicenter, was the closest inhabited area to the fault rupture that generated both the earthquake and tsunami, so it was by far the most severely affected area in this great international disaster. On March 28, 2005, a magnitude 8.6 earthquake occurred near Nias Island to the southeast and also generated a damaging tsunami.

Maximum flow depths from the December tsunami exceeded 13 m along a 135 km stretch of the northern Sumatran coast, and the largest



The epicenter of the great Sumatra-Andaman earthquake was close to the coast of Aceh. *Source*: BRR (2009e).

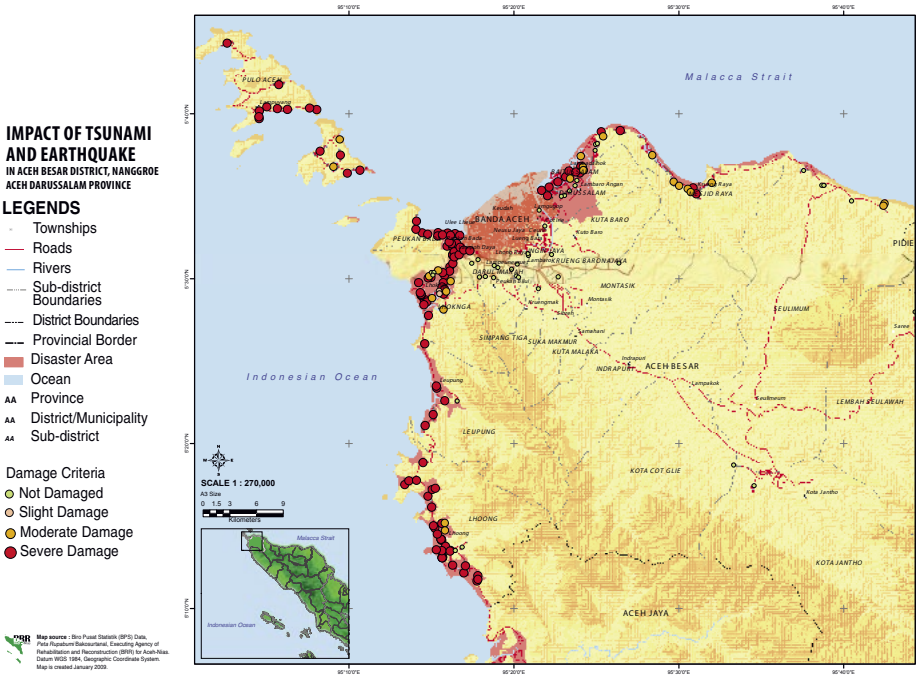
measured heights, at Lhoknga, 15 km southwest of Banda Aceh, were greater than 30 m (Jaffe et al. 2006). The destruction was immense, extending 1,500 m or more inland. In addition to buildings and infrastructure, the tsunami destroyed vital port facilities; because of the area's mountainous terrain, much of its industrial and transportation infrastructure was in coastal areas.

The December 26 tsunami resulted in 128,645 deaths, 37,063 missing people, and 532,898 displaced people in Indonesia, according to the Indonesian government (USAID 2005).[2] Approximately a third of the city of Banda Aceh was stripped bare up to 4 km inland, and 90,000 people died in the city and its immediate vicinity (Bearak 2005). The World Bank's six-month report estimated lost productivity at $1 billion, with half of that in fisheries (World Bank 2005).

This boat was thrown inland from the coastline during the 2004 tsunami and was kept in place as a reminder of the disaster. Photo by Robert Olshansky (2008).

Preexisting Armed Conflict

The governmental response to the disaster was complicated by the ongoing armed conflict in Aceh, nearly three decades old, between the Free Aceh Movement (Gerakan Acheh Merdeka, GAM) and the Republic of Indonesia (Kingsbury 2007).[3] Approximately 35,000 people had already been displaced by the conflict at the time the tsunami struck (Bappenas 2005), and rural areas had few social services because of safety concerns. Furthermore, because of the destruction of courts and legal offices, the justice system was essentially nonexistent, and corruption was rampant. This limited governmental capacity was exacerbated after the disaster by the destruction of public buildings and casualties of public officials: of 76,655 persons employed by local governments in Aceh, 2,992, including the mayor of Banda Aceh, died, and 2,274 were missing (Republic of Indonesia 2005). The post-disaster status of law and order cannot be overstated:



The earthquake and tsunami caused extensive damage along the coast of Aceh and in the city of Banda Aceh. *Source*: BRR (2009f).

legal institutions, police, and detention facilities were totally absent, and reportedly, judges had fled from the area (Bappenas 2005).

The disaster, plus a recent change in president—Susilo Bambang Yudhoyono had just been elected to the post in September 2004—however, offered an opportunity for peace (Waizenegger and Hyndman 2010). Not only was a peace agreement needed in order to allow the Indonesian government and outside organizations to support tsunami recovery, but also Yudhoyono had previously stated his interest in ending the conflict, and he assigned Vice President Muhammad Jusuf Kalla to communicate with the GAM. Shortly after the tsunami, a cease-fire was announced. According to one well-researched account, "The tsunami was a key catalyst, not a cause, of the MoU. It accelerated and amplified the prevalent social and political dynamics towards peace on the ground" (Waizenegger and

Hyndman 2010, 789). The tsunami also created an environment for peace within Aceh: the parties were tired of fighting and of all the suffering, now increased by the tsunami. In the short term, the cease-fire was critical because it allowed international aid to flow into the region.

The Initial Governmental Response

This catastrophic disaster dwarfed any natural event that Indonesia had experienced since its independence, and it had no mechanism to react to it. On December 27, the president declared the earthquake and the tsunami a national disaster, with associated directives to the entire cabinet. On December 30, the national government established the Special Coordinating Unit for Aceh, chaired directly by the vice president and the coordinating minister of social welfare, who went to Aceh to coordinate the relief effort (Republic of Indonesia 2005); this new unit absorbed the existing Bakornas staff, and it functioned as the Jakarta counterpart to the Bakornas office in Banda Aceh (Bappenas 2005). The deputy governor implemented the recovery effort at the provincial level, operating out of the governor's office.

At least 13 countries had mobilized to provide assistance by the end of the first week (Bappenas 2005). It took a few days before international aid workers were allowed into Aceh, and even then, they were limited to Banda Aceh and Meulaboh because, despite the official cease-fire, fighting continued in some areas (Multi-Donor Fund for Aceh and Nias and Java Reconstruction Fund 2012). The response of private charities was unprecedented. By six months after the tsunami, it was reported that the Red Cross and the Red Crescent alone had raised $1.8 billion, with hundreds of millions more dollars coming from other aid organizations; these amounts were similar to those provided by official donors and Indonesian public sources (World Bank 2005).

To strengthen the provincial-level response, the national government issued Decree Number 3 on January 18, which appointed the coordinating minister of social welfare as the chair of the provincial coordinating agency (Satkorlak) and the army deputy chief of staff and the deputy governor of Aceh as vice chairs, charged with restoring governmental func-

tions (Republic of Indonesia 2005). Emergency response tasks included evacuation, burial, refugees, sanitation and water supply, debris, and temporary dwellings. In addition, the Ministry of Home Affairs sent 156 staff to assist local governments under the direct coordination of the Aceh deputy governor.

ORGANIZING FOR RECOVERY

Initial Plans

The government of Indonesia understood that the first important step was a damage and loss assessment to gain an initial understanding of the reconstruction challenges facing it (Hadi 2008). One week after the tsunami, Badan Perencanaan Pembangunan Nasional (Bappenas), the national development planning agency, was asked to lead this effort, which required coordination of multiple government agencies, as well as numerous international agencies, foreign governments, and international NGOs (Bappenas 2005).

The purpose of this effort was to provide a preliminary assessment for the International Consultative Group of Indonesia meeting on January 19–20, which was the first step in the process coordinated by the World Bank of requesting reconstruction funds from international donors. This rapid assessment of such a large and often inaccessible disaster area was a significant achievement that involved "information from line ministry assessments, relief, donor and NGO agencies on the ground, satellite imagery and aerial photography, and intensive use of what was known about the area before the disaster from survey data (village survey data, household survey data, satellite imagery, government data and other data compiled by the national statistical agency)" (Bappenas 2005, ii). This process also helped lay the foundation of working relationships needed for the reconstruction work.

The preliminary assessment estimated $4.45 billion in losses; direct damage costs were two-thirds of this amount, and losses to income flows were one-third (Bappenas 2005). Half the roads in Aceh province were affected. Although the effect on Indonesia's national GDP was small—about

0.1 percent to 0.4 percent—the total damage represented 97 percent of Aceh's annual GDP. Aceh's total population was 4.4 million, of which 2.8 million were affected by the disaster. Beyond the numbers, the disaster had devastating effects on the personal livelihoods of the population: "The damage and loss assessment demonstrates that it is the private livelihoods of people and communities that have been most hard hit by the earthquake and tsunami disaster. . . . Addressing the impact of the disaster on the livelihoods of the survivors should constitute the crucial part of the reconstruction effort" (Bappenas 2005, 75),

The next step for Bappenas, was to complete a blueprint for a master recovery plan. Suprayoga Hadi, a deputy director of Bappenas charged with coordinating all the donor agencies and ministries, emphasized the critical importance of completing the blueprint as rapidly as possible in order to allow the reconstruction funding and planning processes to begin (Hadi 2008). The scope and speed of completion of both the assessment and the blueprint efforts were unprecedented, even for the experienced United Nations Development Programme (UNDP) technical staff and consultants who assisted. The 12-volume blueprint was released on March 26 as the *Master Plan for Rehabilitation and Reconstruction of the Regions and Communities of the Province of Nanggroe Aceh Darussalam and the Islands of Nias, Province of North Sumatera* (Republic of Indonesia 2005). Meanwhile, the government had been meeting with potential donors, and by the release date of the plan, the Indonesian government already had signed MOUs with the Australian government, the Asian Development Bank, and the World Bank (Republic of Indonesia 2005).

With the release of the master plan, the government declared the end of the "Emergency Response" period and the initiation of the 9-month "Rehabilitation Stage," the main goal of which was "to enhance public services up to an acceptable level," with additional goals to "solve various issues related to the legal aspect through settlement of rights on land, and to the psychological aspects through the handling of disaster victims' trauma" (Republic of Indonesia 2005, II-10). The subsequent "Reconstruction Stage" was expected to begin in July 2006 and be completed by December 2009.

Recovery Principles and Community-Driven Development

The January 19 loss assessment established a set of key principles underlying the subsequent recovery strategy:

- A people-centered and participative process, in which the administration would listen to and understand the feelings and aspirations of the people.
- A holistic approach—rebuilding based on a comprehensive strategy.
- Effective coordination for consistency and effectiveness among sectoral and regional programs at national and local levels.
- A distinction between rehabilitation—achieving minimum standards—and reconstruction, with a clear strategy for each.
- A focus on services and institutions rather than projects.
- Incorporation of fiscal transparency and effective monitoring into the rehabilitation and reconstruction programs. (Bappenas 2005, 94)

The master plan further elaborated on these principles, emphasizing a participatory community-oriented process, a holistic and integrated recovery strategy, transparency and accountability, evaluation, and special attention to those most vulnerable and those who had lost the most (Republic of Indonesia 2005, III-2). It contained policies for reconstructing the community (including the education, health, and legal sectors and religious and traditional institutions), the economy, infrastructure and housing, and governance. The expected outcomes were restoration of public services, livelihoods, and governance.

Along with fighting corruption and professionalizing the recovery process, Indonesia was determined to support community-driven recovery, even given the risk that it might slow the recovery process. Using a community-based approach as the central principle of recovery was a bold step at the time, but the plan's authors recognized that "participatory processes are often slower than top-down alternatives but are more effective over the long term because the plans have full community support" (BRR 2005, 7). While emphasizing hazard risk reduction, the policies also prioritized resident choice: "Residents have the right to decide where they will

live, namely to: return to their place of origin or move to another location. The Local Governments should provide information, regulations, facilities and infrastructure including protective and escape facilities for those wishing to live in a potentially unsafe zone" (Republic of Indonesia 2005, V-1–V-2).

The plan described a goal of equality among "the government, the community and the business world (citizens)" while recognizing that capacity did not currently exist (Republic of Indonesia 2005, VII-1–VII-2). It called on the government to facilitate the process, but it also recognized the need for NGOs and universities to fill the gaps where local capacity did not exist. It recommended a development council of multiple stakeholders at each governmental level and specified the responsibilities of these councils in implementing, monitoring, and evaluating development plans (Republic of Indonesia 2005, VII-4).

Indonesia, and Aceh in particular, had pioneered community-driven development (CDD) projects before the tsunami. These programs were readily adapted for post-tsunami recovery. The Kecamatan Development Project (KDP), "one of the world's largest CDD programs" (World Bank 2005, 28), had been operating in Indonesia since 1998 and at the time of the tsunami was active in about half of Aceh's subdistricts (*kecamatan*) and 17 of 21 subdistricts in Nias. This program, funded by the World Bank, provided block grants to subdistricts, and villages decided how to use the funds (e.g., for infrastructure or for livelihoods). As a result, in Aceh at the time of the tsunami, an organizational infrastructure existed, including 196 facilitators, who had in turn organized about 8,000 voluntary village facilitators (World Bank 2005). The Urban Poverty Project (UPP) applied a similar method to urban areas. Despite this previous experience, the approach still caused some confusion and delays during the first few months of its post-tsunami application because of insufficient numbers of trained facilitators for this expanded effort; the KDP recruited an additional 350 facilitators by June 2005 (World Bank 2005). The World Bank, in its six-month report, recognized the inherent "trade-off between wanting to deliver results and building capacity of local people and institutions. These trade-offs are limiting the pace of community reconstruction today, but hopefully enhancing its sustainability" (World Bank 2005, 28).

Financial and Land Resources in Recovery

The April 2005 master plan prioritized funding for public facilities over reimbursement to persons for private losses with the intention of addressing preexisting service and infrastructure deficiencies and building a "better" Aceh and Nias (World Bank 2005, xv). Regarding private losses, the government "decided to compensate private losses only up to a limit, to target the poor and middle class and avoid moral hazard" (World Bank 2005, 52).

The master plan established the basic policy for housing assistance:

> The government plans to make a contribution for a 36 square meters type house namely Rp. 28 million for a house that is totally destroyed and Rp.10 million for a lightly and moderately destroyed house. The aid may be used to build a core house on the location of the house before the earthquake and tsunami disaster or at resettlement locations made available by the government for those people who wish to be resettled. (Republic of Indonesia 2005, VI-1–VI-2)

For homes on inundated lands, the government proposed to provide 200 square meters of land in a new location and to take ownership of the previous land. The plan also established a set of grant and loan programs to help individuals, communities, and enterprises resume or start economic activities.

Land title was an issue, given the inundation of lands and the disruption of boundary markers, and was complicated by the fact that only 10 percent of the tsunami survivors could produce the official government-issued land documents to prove that they owned a piece of land before the tsunami (BRR 2009b). The master plan provided policies for various possible combinations of circumstances of land ownership and recognized the special property rights issues faced by women.

As a result of the rapid assessment and Indonesia's systematic approach, the April 2005 master plan already identified several sources of funding:

- 2 trillion Rp ($200 million) from the 2005 state budget.
- 3.9 trillion Rp ($390 million) from an international debt moratorium (debt postponed for five years, offered at the meeting of Paris Club on

March 9, 2005), in return for which Indonesia would lose some other grants.
- 8.0 trillion Rp ($800 million) in foreign grants from bilateral donors.
- 7.7 trillion Rp ($770 million) in foreign grants from multilateral donors.
- 13.5 trillion Rp ($1.35 billion) in estimated grants from the private sector.
- 2.49 trillion Rp ($249 million) from reallocation of offshore loans from the Islamic Development Bank, the World Bank, and the Asian Development Bank for projects in progress.
- New offshore "soft loans," such as one from the Australian government amounting to AU$500 million with a repayment period of 40 years, a grace period of 10 years, and 0 percent interest. (Republic of Indonesia 2005, VIII-6–VIII-7)

The balance would come from continued solicitations of donors, NGOs, and reallocations of local-government budgets.

Recovery Organizations

The master plan set in motion the establishment of two key recovery organizations: a multidonor trust fund to collectively manage international donations and a ministerial-level recovery management organization within the Indonesian government. The two new organizations were designed to work together to plan and implement recovery projects.

Shortly after completion of the master plan, on April 12, 2005, the World Bank voted to establish the Multi-Donor Trust Fund for Aceh and North Sumatra (MDF), which officially began on May 10 with the approval of US$250 million worth of projects (Multi-Donor Trust Fund for Aceh and North Sumatra 2005). The purpose of the MDF was to pool the funds of donors, which could then be applied to projects via a prescribed decision process; individual contributors could not dictate the use of their funds. Members or groups of members donating at least $10 million would become voting members, and funding decisions would be made collectively through the Steering Committee, which represented donors, the government of Indonesia, and Aceh civil society.

The trust fund considered only projects consistent with the government's master plan; in practice, this meant that it considered only projects proposed by the Reconstruction and Rehabilitation Agency (Badan Rehabilitasi dan Rekonstruksi, BRR), which was established at the same time. Initially, the MDF designated three partner agencies—the International Development Association, the Asian Development Bank, and three United Nations agencies (the UNDP, UNICEF, and the World Health Organization [WHO])—whose role would be to help define, supervise, and evaluate projects. As of October 26, 2005, the MDF had received pledges of $529.61 million from 15 donors (Multi-Donor Trust Fund for Aceh and North Sumatra 2005). Notably, some donors chose not to participate in the MDF, preferring to maintain direct bilateral relationships with the Indonesian government (Masyrafah and McKeon 2008).

Chapter 10 of the master plan outlined the structure of a new rehabilitation and reconstruction agency to report directly to the president, equivalent to a ministerial-level agency. This was the pivotal moment in organizing the recovery. The new organization grew logically out of the blueprint and assessment processes and became the key to shaping the recovery process over the next four years.

The BRR was officially established on April 30 in accordance with the principles laid out in the master plan (World Bank 2005). Its mission was "to restore livelihoods and strengthen communities in Aceh and Nias by designing and implementing a coordinated, community-driven reconstruction and development program with the highest professional standards" (World Bank 2005, 20). As laid out in the master plan, the BRR consisted of three entities, each reporting directly to the president: (1) a full-time implementing agency (Badan Pelaksana or Bapel); (2) a 15-member advisory board (Dewan Pengarah), composed of central-government ministers, provincial governors, and prominent members of Aceh and Nias's civil society; and (3) a 9-member oversight board (Dewan Pengawas) to monitor and evaluate the BRR and handle public complaints (World Bank 2005). A key aspect of the oversight board was its independence; it was responsible for presenting regular reports and independent audits to the president.

The implementing agency's first director was Pak Kuntoro Mangkusubroto, a former minister of mines and energy. Some of its key functions

were to formulate policy, prepare an action plan, conduct reconstruction activities, collect and disseminate information, organize recovery activities of other entities, request assistance from other government agencies, oversee financial flows and prevent corruption, and promote a community-driven recovery. Another key aspect of the BRR was its broad authority to assemble a professional team by hiring the best personnel available and to engage the services of local and international organizations as needed to ensure speed, integrity, and high reconstruction standards. (World Bank 2005)

The BRR began work on April 30 with an initial staff of 12 and cooperation from international agencies, an office borrowed from the United Nations High Commissioner for Refugees, and a computer donated by the U.S. Agency for International Development, but without any funds (Purwanto 2008). After two weeks with no furniture, donors and NGOs began to contribute. The government money finally became available in September 2005.

One of the BRR's first tasks was to quickly review existing projects and donations to ensure that they met minimum standards and were consistent with the goals of the master plan. Because so many different outside organizations were involved in reconstruction activities, the BRR's coordination role was seen as crucial to matching resources with needs. At the same time, the BRR set out to reduce red tape for external aid organizations (World Bank 2005).

The BRR's primary goals at first were to reconstruct housing and infrastructure and to build local government capacity (World Bank 2005). In reality, it emphasized housing—and only the simplest cases, with no relocations—during the remainder of 2005, with the intention of focusing more on infrastructure and livelihoods in 2006 (BRR 2005).

Placing the BRR at the center of coordination was designed not only to increase transparency but also to shift accountability back to the Indonesian and Acehnese governments. Post-tsunami Aceh was ripe for corruption and misuse of funds intended for recovery: "A large part of the challenge in Aceh is that large amounts of funds begin to flow from multiple sources and bound by different sets of rules, at a time when weak control systems, government structures and law enforcement have been

weakened further by the impact and the demands of the disaster" (World Bank 2005, 24). Conversely, the desire of many NGOs to tightly control their funds was counterproductive because it threatened transparency and fueled mistrust. According to a review by the Tsunami Evaluation Coalition, "Huge amounts of funding encouraged a virtual obsession with 'upward' accountability to donors, the media and the public in donor countries. This discouraged accountability to disaster-affected populations and 'lateral' accountability to other agencies and the governments of affected countries. It also resulted in competition, duplication and waste" (Cosgrave 2007, 11).

The BRR spent its first six months getting organized as a new agency. Key actions included initiating a project approval system for recovery agencies, conducting outreach to determine community needs, establishing an anticorruption unit, setting standards, building relationships with other government agencies, and identifying specific needs (BRR 2005). The members of BRR appreciated the difficult balance they needed to maintain in this "bold venture" to transform the province through broad participation and with a long-term view: "To ensure all stakeholders have a chance to be heard entails extensive, and therefore time-consuming, consultation. However, if the deliberations take too long this unique opportunity may be lost. So the challenge for planning the long-term strategy must be to 'make cautious haste'" (BRR 2005, 173).

Managing the Recovery Process

During its first two years, the BRR faced challenges as it tried to rebuild hundreds of devastated villages, coordinate the activities of large numbers of local and international NGOs, acquire and disburse funds, and restore infrastructure while operating in a difficult governance environment. By midsummer of 2005, Aceh was overwhelmed with aid organizations: 124 international NGOs, 430 local NGOs, dozens of international donor organizations, UN agencies, and several Indonesian governmental agencies (World Bank 2005). For the first six months, infrastructure work focused on humanitarian assistance and emergency repairs to roads and power and communication systems (World Bank 2005). All major emergency

This collection of signs illustrates the large number of international NGOs operating in Aceh after the tsunami. Photo by Robert Olshansky (2008).

sanitation and water needs were met, and temporary water-treatment plants were in operation; the emergency relief work managed to prevent any major disease outbreaks (World Bank 2005).

An important moment in long-term recovery planning was the August 15, 2005, signing in Helsinki of the peace agreement between the GAM and the government of Indonesia. The immediate impact of this agreement was that relief and reconstruction organizations could now access all areas in Aceh (BRR 2005). Post-conflict recovery also would require additional funding because there were affected areas throughout Aceh, beyond the tsunami-affected areas. Furthermore, elections for a new Acehnese government in 2006 would create new sets of challenges. By the end of 2005, this broader effort had not yet raised sufficient resources (BRR 2005).

Initially, NGOs independently led planning in each village, and the BRR was limited to coordination (BRR 2009b). In June 2005, the BRR is-

This example of a village plan was created by a participatory planning process with signed approval by residents and stakeholders. *Source*: BRR (2009g).

sued guidelines for village organization and development that provided initial minimum standards for these planning efforts. Several different NGOs and governmental organizations were involved in early housing construction; their projects ranged from cash support to provision of building materials to prefabricated houses (World Bank 2005). The government's primary housing strategy was to use programs developed by the KDP and the UPP. To facilitate land titling, many communities had already begun community mapping, facilitated by NGOs. This involved developing lists of owners and heirs and sketches of land boundaries. Once a community reached agreement, the National Land Agency promised to validate and survey the area within a month and publicly announce the results. As of mid-2005, about 60 villages had begun this process, mostly within Banda Aceh (World Bank 2005). By 2006, the BRR began to take a more active role in village planning in order to assist villages that other agencies had not reached. It appointed a deputy for housing and settlements and, with the assistance of consultants, used funds from its budget to implement planning in these villages.

Financing remained a challenge in mid-2005, however, because "new procedures that became effective nationwide on January 1st, as part of the new Finance Law to ensure greater efficiency and accountability, resulted in additional delays due to lack of familiarity with the new system" (World Bank 2005, xv) This, in turn, slowed village planning processes. The World Bank identified at least 13 administrative blocks in the pipeline of reconstruction funds in 2005. Because of these delays, by late 2005, the MDF, with the agreement of the president, began to approve many projects off-budget, that is, not through the budget of the government of Indonesia, if it saw this as a more effective route (Multi-Donor Trust Fund for Aceh and North Sumatra 2005). In addition, in October 2005, the BRR established the Recovery of Aceh and Nias Trust Fund (RAN-TF), using its powers to provide alternative funding routes for donors. The BRR partnered with five international commercial banks to administer the funds. By the end of the year, several corporations had donated, as well as Greece and China (BRR 2005).

During the first year, confusion continued regarding the relative roles of international NGOs and the BRR in reconstruction. Although the BRR's goal was to build the capacity of local governments, local officials tended to defer to the NGOs, which, at that time, had direct access to more funds than did government-sponsored entities. The NGOs, however, constituted "a multitude of actors, with wildly differing styles, mandates and levels of effectiveness. This adds to the urgency of effective coordination, but detracts from the possibility of realizing it" (World Bank 2005, 48). Thus, because of the limited capacity of local governments, the BRR began to contract directly for housing to fill identified needs, and it also began to provide block grants to district governments (BRR 2005).

Considerable progress was made during the first year after the tsunami. Through the use of temporary facilities, 90 percent of children were able to return to schools by mid-2005, and a basic healthcare system had returned to most places (World Bank 2005). Temporary work programs were employing 35,000 workers, although unemployment was still high (World Bank 2005). Nevertheless, by the end of 2005, 67,500 people were still living in tents (BRR 2005); it was not until mid-2006 until all displaced people were in temporary housing (BRR and Partners 2006).

At the conclusion of the first year, the BRR determined that the total costs of reconstruction would amount to $8 to $10 billion (BRR 2005, 138). This included the initial estimate of $5.8 billion to rebuild the lives of the people of Aceh and Nias, plus additional funds to ensure that previously inadequate facilities would be rebuilt better. The Parliament approved the 2006 budget on October 27, 2005, including US$583 million that would be available to the BRR in January 2006 for immediate disbursement to BRR-funded construction projects (BRR 2005). Donations also provided important financial resources. By the end of October 2005, the MDF had committed $314 million for projects and concepts (Multi-Donor Trust Fund for Aceh and North Sumatra 2005), mostly for KDP and UPP community-based projects. The MDF also provided technical support to the BRR, as well as priority infrastructure projects directed at rebuilding of critical roads, flood mitigation, and port repair. Timely and effective application of the funds continued to be a challenge, however. For example, although, by the end of 2006, approximately 75 percent of the $8 billion of total commitments (the government of Indonesia, NGOs, and international donors) was allocated to projects, only $2 billion had been disbursed; NGOs had disbursed 60 percent of their allocations, the government of Indonesia 28 percent, and bilateral donors 31 percent (BRR and Partners 2006). Furthermore, there were concerns that the remaining 25 percent would be insufficient to meet significant needs, such as those in Nias.

The evolving nature of the massive reconstruction effort required the BRR to continually adjust its services and priorities. The BRR reorganized in late 2005, dividing into four sections—infrastructure, housing and settlements, economic and business development, and institutional and human resource development—each of which was headed by a deputy director. In addition, the BRR sought to decentralize from its Jakarta and Banda Aceh offices into seven regional offices throughout Aceh. The BRR also saw housing provision as a priority and took a more active role in it in 2006. It promised to "closely support and monitor the twenty largest housing programs (which are expected to build well over 80 percent of the planned houses)" (BRR 2005, 163); if necessary, the BRR itself was prepared to build up to 40,000 houses. To accomplish this, in early 2006, it prequalified 1,200 small contractors to construct small packages of 5 to 14 houses

each (BRR 2009b). Numerous housing problems—including compensation for renters, choices for those who opted not to return to their village, joint land titling between husband and wife, and equity among recipients—also required the BRR to play an active role. In addition, it became clear that because of permanent topographic changes, almost 12,000 households would have to be relocated; this would require land acquisition and more complex planning and consensus processes (BRR and Partners 2006). All these problems, as well as continuing limitations in transportation infrastructure, slowed the pace of reconstruction.

Probably the greatest challenge the BRR faced was managing the tension between taking a more active role and trying to increase local-government capacity because it appreciated that it would dissolve in 2009. A similar tension existed between meeting the need to create permanent livelihoods and supporting the temporary construction-based economy

Most of the damaged housing in Banda Aceh was reconstructed within five years of the tsunami. Photo by Robert Olshansky (2008).

(BRR 2005). The BRR evolved over its four-year life from coordination in 2005 to coordination and implementation ("implementer of last resort") in 2006, regionalization in 2007, and transfer of its functions to permanent agencies in 2009 (BRR 2009d, 6).

From an initial staff of 15 in April 2005, the BRR grew to 300 employees by December 2005 and reached a maximum of 1,576 in December 2007, three years after the tsunami (BRR 2009c). In late 2008, the BRR began to close its regional offices and transfer its responsibilities to local governments. In April 2009, the BRR ceased to exist, and its responsibilities passed to local-, provincial-, and central-government agencies.

NOTABLE RECOVERY FEATURES

Community-Based Development

The Community-Based Settlement Rehabilitation and Reconstruction Project (Rehabilitasi dan Rekonstruksi Pemukiman Berbasis Komunitas, Rekompak) was an innovative reconstruction program that contractually involved a community throughout the entire reconstruction process. Indonesia has since followed this model in post-disaster reconstruction. Supported by the MDF starting in September 2005, Rekompak provided $85 million in grants to 125 communities to rebuild and repair houses and improve community infrastructure (Multi-Donor Fund for Aceh and Nias 2006). The program paid for housing and infrastructure repair and reconstruction decided by community members. It particularly targeted tsunami survivors who had not received aid from other parties (BRR 2009b). The following is a concise description of how Rekompak functions:

> The Rekompak community-driven approach places responsibility for rebuilding settlements in the hands of the communities. Groups of 10–15 families were formed to take charge of rebuilding their own houses. The groups decided in what order to distribute funding to each family and all members of the group contributed to the rebuilding process. A key component of the approach is the development of a community spatial plan by each village to serve as the guiding document for rebuilding. Village teams were formed to rebuild priority infrastructure. Facilitators

> trained by the Ministry of Public Works were assigned to help communities prepare and implement their projects. Grants from the MDF and the Java Reconstruction Fund were deposited directly into community accounts.[4] Funds were released in installments based on progress as defined by agreed-upon milestones. (Multi-Donor Fund for Aceh and Nias and Java Reconstruction Fund 2012, 60)

The group aspect of Rekompak furthers the principles of transparency and accountability.[5] It is also important to appreciate the many roles of the facilitators beyond providing technical assistance and acting as teachers and guides. Facilitators represented a two-way communication link between communities and the government, both explaining government policies to the residents and advocating for the needs of the community. Having a facilitator stationed in the village gave residents an enormous sense of comfort (Soraya 2008).

The BRR later reported that "community-managed projects were 30 percent cheaper than contractor-managed projects, and 96 percent of people were satisfied with the quality" (BRR 2009d, 45). Furthermore, these processes offered long-term benefits for community decision making and financial management. Empowering communities took considerable resources, but this process not only generated a product that was acceptable to community members but also developed new skills.

Rekompak was initiated when the government of Indonesia and the international donors decided that a community-based approach was the most effective way to apply international funds to reconstruction. Its roots were in the KDP and the UPP, and it represented an expansion of these programs to include private housing. It also included a much larger set of villages. The Multi-Donor Fund Steering Committee approved funding in May 2005. Given the unprecedented scale of the damages, a community-based approach was somewhat risky, and there were many dissenters at the time (Multi-Donor Fund for Aceh and Nias and Java Reconstruction Fund 2012). What began as an experiment grew into a highly successful method for reconstruction that has been applied to a succession of Indonesian disasters over the past decade. The Indonesian community-based approach to disaster reconstruction, in turn, owes its origins to successful experiences in other places, most notably after the 2001 earthquake in Gujarat,

India (see chapter 5), as well as after Hurricane Mitch in Nicaragua in 1998 (Multi-Donor Fund for Aceh and Nias and Java Reconstruction Fund 2012).

Data Management, Transparency, and the Anticorruption Program

Information management was a critical part of the BRR's operations. Effective coordination and assurance of transparency both depended on the BRR's role in collecting, assembling, and publicly sharing data. A priority for the BRR was to become a data center that could document and coordinate all the disparate recovery activities. Early in the process, the BRR initiated a number of project-reporting and tracking systems, assisted by the Office of the United Nations Recovery Center, a body created to be a single point of contact between the BRR and 27 UN agencies (BRR and Partners 2006). In an attempt to coordinate nearly 500 recovery organizations, the BRR initiated an approval process for every project, created a database of projects, and held a coordination forum in October 2005. In 2006, the BRR established the Spatial Information and Mapping Center, funded by the government of Norway. A unique management challenge was the influx of foreign goods and personnel, which needed to go through immigration and customs procedures. The BRR established the Tim Terpadu (external services) team in December 2005 to streamline immigration, customs, legal, and consular services; in 2006, it processed over 7,000 immigration requests (BRR and Partners 2006).

It was difficult at first to get all NGOs to provide information for the database, and compliance was less than 50 percent in 2006 (BRR 2009d). Gradually, this improved. International agencies had to be registered in the system to be eligible for Tim Terpadu services. In addition, because the database was public, it placed pressure on agencies from their constituents, national audit agencies, and donors to be transparent and accountable.

One of the BRR's first administrative tasks was to establish the Anticorruption Unit in September 2005. It processed over 1,000 complaints during its first year, and the BRR continued to work on improving training and monitoring of construction activities (BRR and Partners 2006).

Aceh Reconstruction Outcomes

At the conclusion of BRR's four-year life, in April 2009, it published a 15-volume book series that documented its activities, its challenges, and lessons learned. Table 6.1 summarizes the BRR's view of its achievements in four years.

Planning accomplishments included 670 village spatial planning documents, spatial planning for 21 subdistricts, and regional spatial planning for 14 districts or cities (BRR 2009b). The BRR also purchased 514 hectares of land for public use, 461 hectares for housing relocation, and 11 hectares for renters who received settlement assistance. Approximately 39 percent of the housing units constructed were built by the BRR as part of the Indonesian government budget, and 61 percent were built off-budget by approximately 140 NGOs and international agencies, which the BRR registered and tracked (BRR 2009b).

TABLE 6.1. BRR Achievements

Disaster Impact	Recovery Achievement
635,384 people displaced	
127,720 people killed	
93,265 people missing	
104,500 small or medium-size enterprises destroyed	155,182 laborers trained and 195,726 enterprises assisted
139,195 houses destroyed	140,304 permanent houses built
73,869 hectares of agricultural land destroyed	69,979 hectares of agricultural land reclaimed
1,927 teachers killed	39,663 teachers trained
13,828 fishing boats destroyed	7,109 fishing boats built or provided
1,089 religious facilities destroyed	3,781 religious facilities built or repaired
2,618 km of road destroyed	3,696 km of road constructed
3,415 schools destroyed	1,759 schools built
517 health facilities destroyed	1,115 health facilities constructed
669 government buildings destroyed	996 government buildings constructed
119 bridges destroyed	363 bridges constructed
22 ports destroyed	23 ports constructed
8 airports or airstrips destroyed	13 airports or airstrips constructed

Source: BRR 2009c, xiii.

Less than four years after the tsunami, the fishing harbor and market were vibrant places again. Photo by Robert Olshansky (2008).

Economic development was a continuing challenge in Aceh (BRR 2009a). The construction industry boomed in 2006, but many of the workers came from other parts of Indonesia. Similarly, restaurant and hotel business increased in 2006 but then began to slowly decline. The poverty rate in 2008 was slightly less than before the tsunami, but the mismatch of local skills to employment needs was a longer-term problem. One bright spot was agricultural production, which, by 2008, exceeded pre-tsunami levels. The BRR focused its economic development activities on existing livelihoods, such as fishponds and rice fields, and left it to other agencies to lead longer-term economic development initiatives (BRR 2009d). Livelihood initiatives included microfinance programs, such as ones through the Aceh Microfinance Center or one led by the Asian Development Bank, and agricultural development programs. Fisheries infrastructure was a continuing concern (BRR and Partners 2006). Importantly, on December 11,

2006, Aceh held its first democratic election (BRR and Partners 2006). This meant that for its final two years, the BRR was working directly with officials from an elected provincial government.

Independent Evaluations of the Aceh Recovery Process

By early 2008, some organizations had started to conduct evaluations of the effectiveness of post-tsunami assistance. In 2006, Universitas Syiah Kuala, in cooperation with UN-Habitat and with the encouragement of the BRR, evaluated over 60 housing programs that had provided 23,000 houses in 161 villages in Aceh (BRR and Partners 2006). It found that most houses did not fully meet government building code requirements, although they were not unsafe. It also found that quality varied among NGOs and their partners, as did efforts to improve training and construction quality.

In early 2008, the BRR and the World Bank published a review of the impact of all the tumultuous events of recent years on poverty in Aceh (BRR et al. 2008). This study found that the poverty rate in Aceh increased slightly after the tsunami, from 28.4 percent to 32.6 percent in 2005, compared with declining poverty levels in the rest of the country. But in 2006, it fell to 26.5 percent, which was below pre-tsunami levels, though still higher than in the rest of Indonesia. The study found that poverty in Aceh remained mostly in rural areas, which were suffering most from the three decades of conflict, and it became clear that development strategies needed to focus on increasing farm production and improving rural infrastructure, as well as helping rural populations successfully move to urban areas.

The Aceh Community Assistance Research Project (ACARP), a group supported by multiple donors and led by the Australian Agency for International Development (AusAID), involved 27 Acehnese social science researchers in a qualitative study of 18 tsunami-affected villages in mid-2007 (ACARP 2007). This was a systematic, scientific study—including village case studies, household surveys, and focus groups—performed by trained Acehnese researchers and focused on small villages, where most of the Acehnese population lives. Findings on the community-based approach were generally positive. For example, successful villages were those that had broad leadership groups and leaders who facilitated rather than con-

trolled; frequent village meetings also correlated with successful recovery implementation. Generally, the study found that many, though not all, village governments during this period were moving toward greater transparency and accountability. There was also more formal participation by women in village decision making about recovery. Livelihood recovery was still in progress at the time of the study, but, importantly, basic household needs were being met in all the surveyed villages. Village spatial plans were successful in villages where they were followed,[6] but, in general, land ownership issues continued to complicate and impede housing recovery. Finally, housing reconstruction programs continued to be problematic because of delays and "poor communication between the housing providers and intended recipients" (ACARP 2007, xii). On the other hand, the few housing construction programs that involved residents from the beginning proceeded more quickly and with fewer complications.

A 2008 study by the Brookings Institution looked at problems with 266 housing reconstruction programs managed by 120 different housing agencies (Masyrafah and McKeon 2008). Housing construction by NGOs lagged behind that by the government and donors. The researchers found that because many NGOs were unable to deliver on their promises, the BRR needed to fill the housing gap. The Brookings study also looked at coordination challenges among the 435 NGOs, 27 donors, and the BRR, which collectively implemented over 2,000 projects. The top 15 actors accounted for 80 percent of reconstruction funding, which facilitated coordination. Both the BRR and the MDF played important roles in facilitating coordination and minimizing potential administrative costs. In contrast, NGOs missed an opportunity to create a coordinating body, which could have improved efficiency and provided synergies. Information management is vital, and the BRR's requirement of NGO reporting "was critical to the success of the overall reconstruction effort" (Masyrafah and McKeon 2008, 40).

The Aceh Model after the 2006 Java Earthquake

On May 27, 2006, while Indonesia was still overwhelmed by the recovery of Aceh and Nias, an earthquake struck central Java near the culturally

important city of Yogyakarta. Although its magnitude was only 6.3, it caused considerable shaking damage to buildings in the districts of Bantul in Yogyakarta Province and Klaten in Central Java Province. The monetary losses were estimated at US$3.1 billion, which ranked this earthquake "among the most costly natural disasters in the developing world over the past ten years" (Bappenas et al. 2006, ix), higher than the costs from the 2004 tsunami in Sri Lanka, India, and Thailand and similar to the 2001 Gujarat, India, earthquake and the 2005 Kashmir earthquake. Private homes and private-sector assets accounted for most of the losses. Approximately 154,000 houses were destroyed, and 260,000 had some damage; this meant that more houses would have to be replaced or repaired than in Aceh and Nias (Bappenas et al. 2006). In addition, 30,000 enterprises were affected, and job loss was another major cost of this earthquake. This was a concern because of the large number of poor households in the affected region. Although the household and livelihood impacts of the earthquake were severe, the recovery process was not as difficult as in Aceh, primarily because infrastructure remained intact and local government offices suffered only minor losses (Bappenas et al. 2006).

One of the most notable features of the recovery was the immediate decision, based on the experiences in Aceh, to emphasize community-based housing reconstruction, using the Rekompak model. The Indonesian government's *Action Plan for Post-disaster Rehabilitation and Reconstruction in Yogyakarta and Central Java* (described in UNDP and Bappenas 2006) consisted of three elements: (1) housing recovery, with the goal of eliminating the need for tents by the end of 2007; (2) public infrastructure recovery to support redevelopment of the region; and (3) economic recovery, using tools such as microfinance to create employment opportunities.[7]

On July 21, Presidential Decree No. 9/2006 created the Coordination Team for Rehabilitation and Reconstruction for Yogyakarta and Central Java (Tim Teknis Nacional, TTN) to coordinate, monitor, and evaluate implementation of the action plan, with a life of two years (Hadiwigeno 2008). The TTN had two parts: (1) a steering team for formulating policy, chaired by the coordinating minister for economic affairs and representing relevant ministries and governors; and (2) an implementing team for

In Yogyakarta, new homes were constructed adjacent to those that had been damaged by the 2006 earthquake. Photo by Robert Olshansky (2008).

formulating strategic actions, chaired by the governor of each province and established in each of the three affected provinces. It was charged with coordinating with local governments and reported directly to the president (UNDP and Bappenas 2006).

In effect, the TTN was the equivalent of the BRR, applied in a setting of existing governance institutions. It was funded by the national government, and its role was to improve coordination and communication between the national and local governments (Hadiwigeno 2008). It helped keep locals informed of national policies, and it monitored local implementation issues. Because the recovery policies emphasized local initiative, it was important to keep local communities well informed. In the opposite direction, the TTN received complaints, investigated, and then reported the problems to central-government agencies. It also issued

regular progress reports (Hadiwigeno 2008). The TTN was a new approach that was pioneered in this case and was improved and refined in two subsequent disasters.

As part of the UNDP's continuing development role in Indonesia, its staff provided valuable technical assistance to the government of Indonesia and the provinces in developing and implementing the recovery plan. The UNDP began as the leader of the early recovery cluster, which coordinated UN agency activities related to early recovery and restoration in the weeks after the earthquake (UNDP and Bappenas 2006). This was an important aspect of this recovery management process because the availability of UNDP resources and expertise allowed the national and provincial governments to expand their capabilities.

Replicating the successful organization of the MDF, at the request of the minister of finance, six international donors—the European Commission, The Netherlands, the United Kingdom, Canada, Denmark, and Finland—established the Java Reconstruction Fund (JRF) to manage and coordinate the application of reconstruction funds (Java Reconstruction Fund 2012). The JRF began operation in October 2006. Like the MDF, the JRF was governed by a steering committee, which consisted of representatives from the TTN, the contributing donors, and the World Bank as trustee. The committee was cochaired by the Indonesian government representative, the European Commission, and the World Bank. In 2008, the Asian Development Bank joined the fund; with its contribution of $10 million, the total amount pledged to the JRF was $94.06 million. The JRF also covered areas of West Java struck by a tsunami in July 2006 (Java Reconstruction Fund 2008). The original plan was that the JRF would dissolve in three years, in October 2009, but because of subsequent disasters, its life was later extended to December 2011 and then to December 2012 (Multi-Donor Fund for Aceh and Nias and Java Reconstruction Fund 2012).

Because of the success of Rekompak in Aceh, when the earthquake struck central Java in 2006, the government of Indonesia selected the Rekompak approach as the basis of its post-earthquake reconstruction efforts (Multi-Donor Fund for Aceh and Nias and Java Reconstruction Fund 2012). This approach applied to the housing programs supported by the JRF, as well as by the government of Indonesia. It began with a pilot pro-

gram, implemented through the UPP, which targeted the poorest households in the most affected urban areas. Lessons learned from Aceh were used to refine the process in Java, for example, by better integrating disaster risk reduction into all activities.

By the middle of 2008, the Indonesian government had disbursed Rp 5.4 trillion ($540 million) to rebuild 279,000 houses and rehabilitate 253,000 more (Java Reconstruction Fund 2008).[8] In addition, through the JRF, the Community-Based Settlement Reconstruction Project (JRF-Rekompak) rehabilitated 15,153 houses (Java Reconstruction Fund 2008). As a result, 97 percent of earthquake victims had new earthquake-resistant homes two years after the earthquake, and 300,000 houses had been completed, "making this one of the fastest housing reconstruction projects in the world" (Multi-Donor Fund for Aceh and Nias and Java Reconstruction Fund 2012, 104).[9] Despite the speed, studies showed that most of the new government-funded houses were generally well constructed, although many did not meet all the desired seismic design principles (International Recovery Platform 2009).

Formalization of Disaster Management

In 2007, Act No. 24/2007 on Disaster Management and Presidential Decree No. 8/2008 created a new national disaster management agency, the Badan Nasional Penanggulangan Bencana (BNPB) (Pacific Disaster Management Information Platform 2012). In addition, Indonesia mandated that all provinces and municipalities establish regional disaster management agencies, Badan Nasional Penanggulangan Bencana Daerah (BPBD). This new structure added disaster risk reduction to the previous emphasis on emergency response (BNPB ca. 2010). In 2006, the national government had made disaster risk reduction one of its national development priorities, and the BNPB provided a platform for facilitating it (BNPB et al. 2009). The new laws specified the BNPB's role in post-disaster recovery (both reconstruction and rehabilitation), defined recovery functions, and described budget responsibilities. They empowered the BNPB to coordinate loss assessment and the implementation of rehabilitation and reconstruction (UNDP and BNPB 2009).

The BNPB began operation in January 2008. The head of the BNPB reports directly to the president, and the BNPB works with the Ministry of Home Affairs to create provincial and local disaster agencies (UNDP and BNPB 2009). The Ministry of Home Affairs and the BNPB issued guidelines for the establishment of provincial-level BPBD agencies, and as of October 2009, 16 of the 33 provinces had established a BPBD (BNPB 2009).

THE 2009 WEST SUMATRA (PADANG) EARTHQUAKE

On September 30, 2009, a magnitude 7.6 earthquake struck the province of West Sumatra, causing 1,100 deaths and affecting 13 of the province's 19 districts (BNPB et al. 2009). The worst-affected areas were the cities of Panaman and Padang; the latter is the province's largest city and capital, with a population of about 900,000. Damage and losses were estimated at Rp 21.6 trillion (about $2.2 billion). Many government buildings collapsed, especially in Padang. This affected the government's ability to lead the response and recovery efforts; many offices operated out of temporary buildings and tents. Trade was severely affected because Padang is the region's major trading center.

By any measure, the disaster was enormous because of the loss of life and extensive damage to the most important economic center in West Sumatra. The 2009 earthquake provided an opportunity for Indonesia to demonstrate its new skills in disaster recovery and test its policy and administrative innovations after the 2004 and 2006 earthquakes. Both the Indonesian president and the vice president visited the area shortly after the quake, and the government initially provided Rp 100 billion ($10 million) in emergency relief funding and promised Rp 6 trillion ($600 million) soon (BNPB et al. 2009).

From October 9 through October 17, the government, led by Bappenas and the BNPB, and partners conducted a comprehensive damage assessment, using the systematic methodology developed over the past few disasters in Indonesia (BNPB et al. 2009). The results were published October 30, just one month after the earthquake.

Economic recovery and reconstruction relied on funds from the national budget, along with private-sector funding. International assistance was used for public and social facilities and for infrastructure projects. The BNPB, along with Bappenas and the Ministry of Finance, coordinated all the funds (BNPB et al. 2009). Disaster risk reduction was a priority in the reconstruction, especially through seismic-resistant construction of new buildings, retrofitting of existing public buildings, and tsunami warnings and evacuation plans.

The new BNPB led coordination of all the recovery and rehabilitation activities, and the provincial governments led implementation. The BNPB formed a technical support team (TPT) on November 20, 2009, to assist the governor of the province of West Sumatra (Pranoto et al. 2011).[10] It was, in effect, an extension of the national BNPB in the province, and its tasks were similar to those of the BRR in Aceh, as well as those of the TTN in Yogyakarta. TPT members came from the BNPB, the local-government task force, and universities. Its responsibilities were to advise on policy, develop action plans to accelerate reconstruction, assist the governor in coordinating activities, and monitor and evaluate. In a way, the TPT was the culmination of organizational innovation begun with the BRR in Aceh and refined in the TTN in Yogyakarta. But with the inception of the BNPB and the new provincial BPBDs, in the future, in provinces with a well-established BPBD, an organization like the TPT will be less necessary, and provincial and district BPBDs should be sufficient to lead rehabilitation and reconstruction; the role of the BNPB will be to "provide technical assistance in order to strengthen the provincial/districts BPBD" (Pranoto et al. 2011, 80).

The stated goal was to complete reconstruction activities within two years. The action plan and the BNPB budget were established to exist for two years, although this period was later extended one additional year (Fauzon 2012). A visit to Padang in October 2012, however, showed that although most of the city had recovered, not all reconstruction was complete. Only about half of the approximately Rp 6 trillion allocated by the action plan had ever materialized. Some of the housing programs were not yet funded, and reconstruction of public buildings was incomplete. Several

schools and one hospital had been reconstructed through funds from international donors (Aryadi and Asnulza 2012). The BNPB had paid for the rebuilding of six provincial-government buildings, as well as police and court buildings, a hospital, and university buildings (Fauzon 2012). But the city government's buildings, including city hall, were still awaiting repairs.

THE 2010 ERUPTION OF MOUNT MERAPI

Merapi is a highly active volcano approximately 17 miles north of the city of Yogyakarta, and it has erupted regularly for hundreds of years. Increased activity in April and May 2006 led to evacuations of thousands of residents. On October 26, 2010, Merapi dramatically erupted, immediately causing 38 deaths and the evacuation of 70,000 people from the danger zone (IMDFF-DR 2012). The largest eruption occurred on November 5, and officials widened the evacuation zone to 20 km from the crater (IMDFF-DR 2011). The continuing series of eruptions ultimately cost 339 lives, displaced over 500,000 people, and destroyed 5,059 houses in four districts of the provinces of Yogyakarta and Central Java.

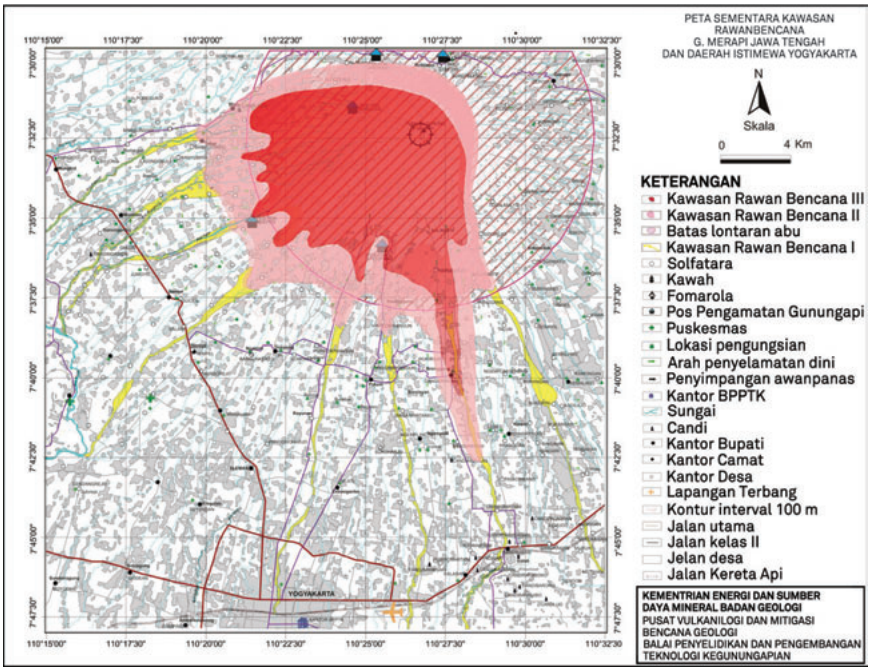
After the eruption, lahar debris flows posed a continuing hazard as floodwaters carried volcanic ash farther down the slopes. This process, commonly called *cold lava*, affected scores of communities and destroyed farmland (IMDFF-DR 2012). In contrast to Indonesia's 2004 and 2006 tsunami and earthquake disasters, reconstruction and recovery from the 2010 Merapi eruptions were constrained by the ongoing hazard.

The Indonesian Volcanology and Geological Disaster Mitigation Center produced a Merapi Hazard Map; Hazard Zone III was not recommended for human settlement. The population of Zone III before the eruption was approximately 79,600, according to the June 2011 *Action Plan for Rehabilitation and Reconstrution* (IMDFF-DR 2011). In marked contrast to the recovery after the 2006 earthquake, the primary recovery program after the 2010 eruption involved population relocation and resettlement rather than reconstruction in place. The government offered several voluntary options for resettlement from Hazard Zone III, ranging from government buyout and relocation to allowing residents to remain in place, but with no government protection.

Volcanic ash and lahar debris from Mount Merapi buried farms and agricultural villages, but these damaged areas are still surrounded by highly fertile lands. Photo by Robert Olshansky (2012).

The goals of the reconstruction process were to provide housing and infrastructure in safe locations, compensate owners for loss of property, and rehabilitate economic development infrastructure and provide livelihood assistance. The plan emphasized the importance of integrating "hazards identification, risk assessment, mitigation measures and preparedness actions" into the local processes, with the risk map "obligatory as a strategic tool to reduce loss of life and property" (IMDFF-DR 2011, 6). In addition, it sought to revitalize the health, education, and social infrastructure in the area.

The post-earthquake community reconstruction programs in Java were mostly complete in 2010 when the most severe Merapi eruptions occurred and affected some of the same areas, including 45 villages with JRF-funded projects (Multi-Donor Fund for Aceh and Nias and Java Reconstruction Fund 2012). The JRF Steering Committee agreed to extend



This hazard map of the slopes of Mount Merapi shows that Zone III (red) is too dangerous for human habitation. *Source*: Indonesia Multi-Donor Fund Facility for Disaster Recovery (2011).

the JRF until December 2012 and allocated $3.5 million of its remaining funds to Rekompak for villages affected by the Merapi eruptions.

The governors of Central Java and Yogyakarta were responsible for the recovery actions, supported by a technical assistance team (Tim Asistensi Rehabilitasi dan Rekonstruksi Wilayah Pascabencana Erupsi Gunung Merapi) that was established by presidential decree and cochaired by the coordinating minister for economy and the BNPB (IMDFF-DR 2011). The BNPB supervised and funded the operation of the technical assistance team, and the director of the BNPB appointed its members. An important role of the team was to improve communication between the central government and local governments (Bayudono 2012). It advised the BNPB on how to more effectively implement its policies in the local-government environment and provided technical assistance and training to build the capacity of local organizations. As a quasi-governmental body, it was also

New housing in dense villages was constructed for families relocated from the volcanic hazard zones. Photo by Robert Olshansky (2012).

able to coordinate the activities of NGOs, which played a key role in providing facilitators to the villages. The technical assistance team held frequent coordination meetings, often more than once a week. These were designed to solve specific coordination problems that had surfaced in the less frequent BNPB-led coordination meetings.

A key aspect of the Merapi recovery was the livelihoods program. The essence of the Merapi recovery is the relocation of villages from the high-hazard areas to land purchased from other villages, generally village trust lands. This means that farmers are moved into dense villages, with only 100 square meters of land for each household. The key to making this process work is to provide new livelihood opportunities for residents who formerly depended on farmland. The Merapi livelihoods program built on the JRF livelihoods program after the 2006 earthquake, which, through 2011, had assisted over 15,000 small enterprises in 42 villages (Java Reconstruction Fund 2011).

It is still too early to evaluate the success of this experiment in community livelihood transformation. Because of bureaucratic delays, relocations did not begin until early 2012. To monitor the process over time, the BNPB and the UNDP are leading a longitudinal study of the effect of the Merapi eruption on households and communities (Sikoki 2012). Beginning in 2012, researchers sampled households over time in areas with different levels of damage, as well as nearby control areas, and this study will help monitor and advise the recovery process in case of future eruptions.

In one sense, the recovery from the Merapi eruption built seamlessly on the Rekompak lessons learned in Aceh and developed fully in Yogyakarta. The need for relocation and new livelihoods, however, made the process much more complex because of the administration of land acquisition and development and the household disruptions involved in relocating and changing livelihoods

LESSONS

The recovery of Aceh and the role of the BRR have several remarkable aspects. The scale of the disaster was immense throughout Aceh, and the ongoing conflict between the government of Indonesia and the GAM complicated relief and recovery. The disaster attracted an unprecedented outpouring of international donations, the largest international post-disaster recovery effort to date. The enormous amount of recovery resources provided both opportunities and challenges. Those who managed these resources had a great responsibility to Aceh, Indonesia, and the world community. Some of the notable features of Indonesia's management of the recovery included the following:

- An emphasis on community-based planning, with repeated insistence that communities make their own decisions regarding spatial planning and allocation of resources.
- Transparency, accountability, and professional program management, including aggressive anticorruption efforts, as well as publicly accessible web-based project-tracking tools.

- Extensive data collection and management.
- Complex systems for adjudicating land ownership in an environment with few legal records, land subsidence, obliteration of landmarks, and thousands of deceased landowners. The introduction of joint titling between husband and wife was an important achievement.
- Frequent monitoring and evaluation by both internal and external entities. As a result, recovery policies and priorities evolved based on documented needs, and the BRR reorganized its structure every 6 to 12 months. The continuing process of self-reflection also led to repeated innovation.

By all accounts, the recovery of Aceh was remarkably successful, although imperfect, as the BRR has freely admitted. One measure of the success was the continuing flow of commitments and donations over the life of the BRR; international donors saw that this was a process they could trust. At the time of this writing, Aceh is generally peaceful and has a much stronger economy and a more capable government than at the time of the disaster.

The BRR and associated organizations served as valuable incubators of ideas about post-disaster recovery. The process was a valuable learning experience for Indonesia, the World Bank, UN agencies, and other international organizations. Its lessons have directly informed subsequent disaster recovery operations in Indonesia and have influenced the work of international organizations elsewhere in the world.

Because of all the external donors, as well as the immensity of the challenge, the BRR's work in Aceh was well documented. Not only were there numerous external evaluations, but also the BRR itself, conscious of its pioneering efforts, was remarkably reflective regarding the strengths and weaknesses of its efforts. The 15-volume book series published in 2009 tells the story in great detail and openly discusses some of the struggles and dilemmas along the way. Eager to share its hard-earned lessons, the BRR also published *10 Management Lessons for Host Governments Coordinating Post-disaster Reconstruction* (BRR 2009d), grouped into three categories:

ORGANIZE

1. Quickly establish a coordinating agency with adequate powers.
2. Appoint a strong, experienced leadership team to gain full support of other government agencies and the donor community.
3. Maintain a crisis mind-set throughout the entire reconstruction effort.
4. Build a strong implementation capability for the coordinating agency to fill reconstruction gaps.

EXECUTE

5. First meet basic needs, fill supply chain gaps, build a coordination war room, and involve affected communities in reconstruction.
6. Build back better at every opportunity.
7. Utilize key partner agencies to play supporting coordination roles.
8. Manage beneficiary and donor expectations about pace and progress of reconstruction through constant communication.

FUND

9. Ensure integrity and accountability of funds to gain donor confidence and support.
10. Mix diplomacy, authority, and flexibility to ensure that funding flows meet actual needs.

The BRR's reflections on the crisis mind-set provide valuable advice. For example, one important approach was to manage processes in parallel rather than sequentially (BRR 2009d). The BRR also offered advice on balancing speed against its costs:

> Be explicit in acknowledging the inevitable trade-offs between speed and quality. It was one of BRR's strongest operating principles that it could not afford the luxury of letting the perfect become the enemy of the good. Both donors and disaster victims demanded decisive action from BRR, and that at times led to projects being approved with fewer reviews

> and checks than would be typical in more normal circumstances. For example, BRR's early, laissez faire approach to approving donor-funded housing projects sometimes resulted in poor quality structures that the beneficiaries rejected and left vacant. However, this was accepted by BRR as the price for speed—better to have 100,000 houses built and rectify mistakes for a few thousand than to have 20,000 perfect houses. BRR also learned from its early mistakes in the housing sector and subsequently set housing standards to ensure that the quality improved. The trade-off between speed and quality is also a dynamic one, and must be continually re-assessed. With smaller, short-term projects, speed may be the paramount concern, but quality becomes more important for longer-term projects. (BRR 2009d, 27)

A unique aspect of the BRR was that, although it emphasized its role as a coordinating agency, it took on direct implementation when it became clear at the end of the first year that critical reconstruction actions were lagging. The BRR was responsible for the on-budget Indonesian government funds, and so it acted to more directly control the application of those funds. An important lesson from Aceh is that after a large and complex disaster, a coordinating agency may need the flexibility to act on its own to fill critical gaps.

The success of the community-based projects in Aceh provided positive models for Yogyakarta and Central Java after the 2006 earthquake. By all evidence, the rapid recovery after the 2006 disaster was a remarkable success, and independent evaluations concur (International Recovery Platform 2009). Some of the reasons stemmed from preexisting conditions: the survival of most of the critical infrastructure needed to support reconstruction and the strength of existing local and provincial institutions. But the design and implementation of the post-disaster programs were also critical to the success. The widespread provision of transitional housing on or near existing homesites helped facilitate rapid recovery. Not only was this a success of physical construction, but also surveys indicate widespread satisfaction with the community-based reconstruction planning process (International Recovery Platform 2009). Thus, in this case, building back better included not only improved construction practices but also transparent community learning and decision processes and the acquisition of new skills.

The subsequent Merapi recovery, also in Yogyakarta and Central Java, encapsulated two important aspects of the rapid evolution of Indonesia's emergency management and disaster recovery systems. First, the Merapi recovery program shows how quickly the concepts of poverty alleviation and disaster risk reduction have become intertwined in Indonesia, and both are being implemented through community-based planning and community empowerment. Second, the Merapi situation has presented new challenges, and the struggle to relocate communities and reinvent the lives of residents is ongoing.

Finally, the recovery from the West Sumatra earthquake illustrates several aspects of Indonesia's still-evolving disaster recovery system. First, it shows the value of the technical support team as a policy and oversight body; its ability to draw on lessons from other recent disasters made it all the more valuable. Second, the recovery also shows the growing role of the BNPB and the provincial BPBDs, which in time will probably supplant the technical support team. This means that a professional organization, tested by the experiences of several disasters, is probably the best way to manage recovery. Third, despite Indonesia's ongoing success in improving its disaster practices, it shows the continuing role of international NGOs in filling gaps in humanitarian needs and the continuing need for technical assistance and capacity building provided by UN agencies, particularly as Indonesia continues to build a nationwide professional emergency management system. Fourth, this case illustrates what happens when the money runs out. Although West Sumatra benefited from many international donations and from technical assistance from abroad, Indonesia cannot expect huge sums of international aid, as happened in Aceh and Yogyakarta. The West Sumatra case shows that difficult choices must be made—to provide essential funds to the most heavily damaged houses, to repair lifeline systems, and to strategically prioritize reconstruction and repair of government buildings over time.

NOTES

1. Suprayoga Hadi (Bappenas) and Pungky Sumadi (Bappenas) provided firsthand information regarding the initial phase of recovery in Aceh, and Togu Pardede

(Bappenas) served as collaborator, host, tour guide, and information broker for the multiple disasters that struck Indonesia in the years following 2004. Travel was supported by the University of Illinois Research Board and by Kyoto University.

2. The March 28 earthquake caused an additional 626 deaths and displaced 34,000 people, according to the UN (USAID 2005). According to the World Bank's six-month report, 127,000 houses were destroyed in Aceh, and about as many were damaged; in Nias, 35,000 houses were destroyed or damaged (World Bank 2005).
3. The initial catalyst was a contract signed by the Indonesian government regarding export of offshore liquefied natural gas, but Acehnese autonomy had been a long-standing issue; for this reason, the Jakarta government had granted "special administrative status" to Aceh in 1959 (Kingsbury 2007, 170). From 1989 to 1998, approximately 10,000 to 26,000 people were killed in the conflict. In January 2001, after peace talks in Switzerland, Aceh was made a "special administrative region"; at that time, the GAM controlled about 60 percent of Aceh and was responsible for providing basic services to those areas (Kingsbury 2007, 171). In December 2002, the two parties signed the Cessation of Hostilities Agreement, which was followed by various competing claims. After peace talks broke down in May 2003, the cease-fire ended, and the Indonesian government declared martial law and then launched its largest military operation since the invasion of East Timor in 1975. Aceh was closed to all outsiders, and up to 125,000 people were displaced by the fighting (Waizenegger and Hyndman 2010). Martial law was reduced in May 2004 to a state of civil emergency.
4. The Java Reconstruction Fund was a fund similar to the MDF that was established after the 2006 Yogyakarta earthquake, described later in this chapter.
5. Not only were all the rebuilding processes in a community visible to every community member, but Rekompak also maintained public websites that listed every beneficiary (Multi-Donor Fund for Aceh and Nias and Java Reconstruction Fund 2012).
6. By the middle of 2008, the BRR had finalized 641 village plans; about an additional 100 were still to be completed (Fahmi 2008).
7. The *Action Plan* was released on July 17, 2006, the same day on which a magnitude 7.7 offshore earthquake triggered a tsunami on the south coast of West Java, displacing 29,000 people and taking more than 650 lives; over 1,900 houses were destroyed, and 514 were heavily damaged (Java Reconstruction Fund 2008). This event was eventually covered by the same recovery programs that were initiated after the May 2006 earthquake. The National Disaster Management Agency (Bakornas), led by the vice president, coordinated the response, and the government immediately designated funds for response and recovery.
8. The government program involved 3,000 facilitators, and many more were needed (Saptadi 2008). Each village had at least two facilitators, one technical and one social. Each facilitator was also responsible for reporting for three to five groups of 8 to 15 households each. The JRF program used five-person facilitator teams representing a range of disciplines. The government hired nine consultants to

manage the facilitators, with approximately one consultant for every 20,000 households. Out of a total budget of Rp 3.4 trillion ($340 million) for the government program, it spent about Rp 10 billion ($1 million) for consultants and about Rp 15 billion ($1.5 million) for facilitators (Saptadi 2008).

9. Another related source says that "280,000 houses were reconstructed in less than two years" (Java Reconstruction Fund 2011, 7).
10. In October 2010, at almost the same time as the eruption of Merapi volcano, an earthquake and tsunami struck the Mentawai Islands of West Sumatra, not far from Padang. The same BPBD and TPT team already working in West Sumatra also oversaw the recovery programs after this disaster.

7 United States

An Evolving Recovery Policy Centralized at Federal and State Levels

One of the long-standing principles of federalism and disaster assistance policy in the United States has been that disaster response and recovery are primarily the responsibility of local and state governments. From this premise, it follows that federal assistance should supplement, not supplant, nonfederal efforts. Within a decade, three large-scale, catastrophic urban disasters—the 2001 terrorist attacks, Hurricane Katrina in 2005, and Hurricane Sandy in 2011—demonstrated significant gaps in the disaster policy framework that had evolved over 50 years. These disasters led to the centralization of post-disaster recovery governance and management at both the national and state levels. This shift may have some perverse long-term effects by reducing the recovery authority of local governments and the influence of local citizens. In addition to a variety of secondary sources, this chapter is based on nearly three decades of recovery research and consulting by the authors within the United States.[1]

U.S. disaster response and recovery governance structures and policy also are a reflection of American federalism (U.S. Constitution, Amendment X), which respects the sovereignty of the states and the power of governors to direct activities and coordinate efforts within their states. In disaster response, the principles of federalism have been interpreted to view the federal government's role as support for "state and local governments—who

know the unique requirements of their citizens and geography and are best positioned to respond to incidents in their own jurisdictions" (White House 2006, 11). Thus, although federal laws and regulations for disaster management have been created top-down and apply to the nation as a whole, federal agencies have traditionally not been allowed to dictate what state or local officials must do in emergency management. State and local governments have significant disaster management responsibilities in their own right, and many of these overlap with federal-level responsibilities.

U.S. disaster management works as a shared system in which the over 88,000 local general-purpose governments, special districts, and Native American tribal governments are primarily responsible for supplying response and recovery resources; regional, state, and national agencies provide support as requested. The system is triggered from the bottom up and requires extensive coordination and cooperation among all levels of government, as well as the many private organizations involved in preparing for and responding to disaster. States aid local governments as needed, and the federal government, in turn, aids both.

The primary law that defines the U.S. system, as well as the federal government's role in disaster response and recovery, is the Disaster Relief Act of 1974. It was substantially amended in 1988 and titled the Robert T. Stafford Disaster Relief and Emergency Assistance Act (Stafford Act). Amendments since 1988 have largely responded to lessons learned after disasters. Under the Stafford Act, the Federal Emergency Management Agency (FEMA) is the lead agency in coordinating the federal government's role in preparing for, preventing, mitigating the effects of, responding to, and recovering from all domestic disasters, whether natural or human-made, including acts of terror. FEMA also administers the federal government's core recovery-related programs defined by the Stafford Act: Individual Assistance, Public Assistance, and the Hazard Mitigation Grant Program (HMGP). Other federal agencies with potentially significant roles and resources in recovery include the U.S. Department of Housing and Urban Development (HUD), the Small Business Administration (SBA), the Economic Development Administration, and the U.S. Department of Transportation (DOT).

The governor of a disaster-stricken state typically triggers federal involvement in disaster management through the Stafford Act by requesting that the president declare a major disaster or emergency. According to the Stafford Act, the governor must find that the disaster is of such severity and magnitude that effective response is beyond the capabilities of the state and the affected local governments, and that federal assistance is necessary to supplement the efforts and available resources; must confirm execution of the state's emergency plan; and must certify adherence to cost-sharing requirements (FEMA 2013). The president must then determine that the state's resources are indeed overwhelmed or are incapable of addressing the disaster in order for the federal government to respond. A presidential disaster declaration opens the door to federal assistance for both disaster response and recovery activities.

In the aftermath of presidentially declared disasters, the U.S. Congress has also used a variety of funding options and programs to supplement the Stafford Act allocations in helping states and local governments finance recovery efforts. One rapidly growing piece of Congress's disaster recovery tool kit is the HUD Community Development Block Grant–Disaster Recovery (CDBG-DR) program, which Congress first used in 1993 to provide supplemental disaster recovery funds after Hurricanes Andrew and Iniki and Typhoon Omar. Congress has appropriated over $48.6 billion to the program for post-disaster relief; the three largest appropriations have been for the September 11, 2001, attacks ($3.483 billion); Hurricanes Katrina, Rita, and Wilma in 2005 ($19.7 billion); and Hurricane Sandy in 2012 ($16 billion) (HUD 2014).

Congress can readily apply CDBG funding to post-disaster reconstruction if it closely meets one of the program's three objectives, to "meet particularly urgent community development needs because existing conditions pose a serious and immediate threat to the public" (Boyd 2010, 1). Also, because of their flexibility, CDBG-DR funds can be used in a variety of ways to supplement FEMA funding after disasters, such as restoration of essential services and mitigation of the effects of future disasters; but the grants have also moved beyond traditional disaster relief by funding long-term recovery and reconstruction of businesses, homes, community facilities, and infrastructure.

The National Flood Insurance Program (NFIP) is probably the largest federally funded disaster recovery program, although it is, in principle, funded by owners of flood-prone properties. Nearly 6 million policy holders pay an estimated $3.6 billion in annual premiums for flood insurance (King 2013). In addition to providing insurance settlements to property owners for their flood losses, the NFIP plays another important role in recovery after floods by providing funds for buyouts of flood-prone properties.

Under U.S. federalism, states have the power to plan and regulate land use development and redevelopment and building construction and safety. In turn, most states delegate this regulatory authority to local governments.[2] State planning and zoning laws guide local authorities, but local governments are generally allowed to pass and interpret planning and zoning policies and regulations according to individual community conditions.[3] Most states adopt some form of building codes and then look to local governments to review construction plans to ensure code compliance and to conduct field inspections to ensure consistency of construction quality with building plan requirements. Property taxes are a major source of revenue for most states, counties, municipalities, and special districts.

THE 2001 WORLD TRADE CENTER DISASTER

The terrorist attacks on September 11, 2001, that targeted the World Trade Center in Lower Manhattan and the Pentagon in Washington, D.C., and also resulted in a downed jet airplane in Pennsylvania, killed 2,977 people, and many more people suffered long-term mental and physical health effects. The attacks caused over $100 billion in direct and indirect economic losses to the U.S. economy, and total insurance claim payments exceeded $35 billion, including property, life, and liability insurance claims (Valverde and Hartwig 2006). Arguably, September 11, 2001, was also a major turning point in U.S. disaster management that substantially shaped the nation's response and recovery efforts following Hurricanes Katrina and Sandy and is still influencing disaster policy and actions today.

Reconstruction is pictured here at the site of the World Trade Center. Photo by Laurie Johnson (2010).

ORGANIZING FOR RECOVERY

The Federal Government

The federal government was a primary funder of the World Trade Center (WTC) recovery and rebuilding effort. Its commitment and approach to providing post-disaster assistance to the New York City area were swift, innovative, and flexible. Within days, President George W. Bush pledged at least $20 billion in federal relief and recovery assistance for the September 11 attacks, and Congress authorized the same level of federal assistance, designating about $3 billion specifically for the New York City area in a bill passed by Congress and signed by President Bush on September 18, 2011 (GAO 2003; Mammen 2011). This was the first time in U.S. history that Congress made an expedited and specific appropriation for a specific

disaster instead of supplementing funds in FEMA's Disaster Relief Fund. Over the next 11 months, Congress enacted three more supplemental appropriations of approximately $15.5 billion in direct federal assistance, as well as an estimated $5 billion in tax benefits, for specific application in the New York City area (GAO 2003). To help ensure that all the appropriated funds were spent within the New York City area, Congress also had to authorize several disaster assistance program exceptions, broaden traditional program eligibility guidelines, and allow federal agencies to provide other forms of nontraditional assistance.

Of the $20.5 billion total, about $11.35 billion went to rebuilding and development in Lower Manhattan, $7.28 billion went to emergency response efforts, and $1.88 billion went to general budgetary relief for New York State and New York City (NYCIBO 2011). Together, FEMA, HUD, and the DOT provided $14.65 billion (over 95 percent of the direct federal aid) to the New York City area. This was the largest level of assistance that each agency had ever provided for any single disaster. Fourteen other federal agencies administered the remaining $816 million in direct federal aid (GAO 2003). In addition, Congress approved up to $9.8 billion in awards through the Victims Compensation Fund, established to compensate survivors, relatives, and businesses that suffered losses in the September 11 attacks (NYCIBO 2011).

FEMA had overall responsibility for coordinating the federal efforts. The National Response Plan defined a federal coordinating officer (FCO) position, and FEMA also appointed a deputy FCO for long-term recovery responsible for identifying the needs of the community, coordinating with other federal, state, and local agencies to address those needs, and developing FEMA's long-term recovery plans (Picciano 2006). The deputy FCO for long-term recovery chaired the Federal Task Force to Support New York City, which consisted of representatives of 11 federal agencies and met weekly for many months to develop an understanding of local- and state-government recovery needs and devise comprehensive federal solutions to address these needs. Working with the state of New York, FEMA also established the Infrastructure Recovery Workgroup, which included federal, state, local, and private-sector participants, to coordinate the restoration of public and private infrastructure (Picciano 2006).

FEMA was authorized to distribute $8.8 billion in federal aid, and it distributed $7.4 billion of this amount through the Public Assistance program (GAO 2003). Although there were 191 applicants for the program, New York City, the Port Authority of New York and New Jersey, and New York State (more than 50 agencies, including the Metropolitan Transportation Authority [MTA]) received about 95 percent of the funding (Picciano 2006). President Bush authorized 100 percent funding of all eligible costs for both emergency and permanent work in the Public Assistance program, thereby eliminating state and local cost sharing, which normally can be as much as 25 percent of total project costs. Conversely, Bush capped the available funding for the FEMA HMGP at 5 percent of the total disaster spending instead of the customary 15 percent (GAO 2003).

Despite broadened eligibility guidelines and authorizations for certain activities, there were not enough eligible projects in the New York City area to reach FEMA's $8.8 billion target assistance level. Thus, Congress authorized FEMA to reimburse associated costs that it otherwise could not have funded under the provisions of the Stafford Act. This provision enabled FEMA to close out the disaster in 2003, only two years after the declaration (GAO 2003).

The DOT administered $2.34 billion in grants through the Federal Highway Administration and the Federal Transit Administration (FTA) to restore transportation infrastructure directly damaged in the disaster and enhance the overall Lower Manhattan transportation system (GAO 2003). Additionally, FEMA established an interagency agreement with the DOT and transferred $2.75 billion of its funds to the FTA (GAO 2003). New York's governor and various state agencies helped set the transportation restoration and enhancement funding priorities. The three priority projects were reconstruction of the Port Authority Trans-Hudson (PATH) Terminal station underneath the WTC; creation of the Fulton Street Transit Center hub for the MTA subway system; and improvements to the South Ferry Subway Station (GAO 2003). The FTA established the separate Office of Lower Manhattan Recovery and partnered with state and city transportation agencies to complete the work. Congress also eliminated the state and local matching requirement for DOT assistance for the

entire disaster relief effort, thus providing considerable savings to New York City and the state.

As reported in Mammen (2011), as the federal aid package was being developed, there were different views in Washington, D.C., about how the federal aid should be distributed. Some federal leaders wanted to set up an office of World Trade Center attack claims, but the White House budget director prevailed in dictating that much of the money be distributed by HUD and its CDBG-DR program, which would give local authorities greater flexibility in using the funds. HUD provided $3.48 billion through the CDBG-DR program to fund economic revitalization—economic recovery programs, short-term capital projects, memorial and cultural facilities, and long-term planning—and to aid businesses and individuals (GAO 2003; Mammen 2011). Congress passed some first-time and unique directives for the use of these funds, including grant programs for businesses and publicly and privately owned utilities. Pressured by New York State and the White House, HUD also waived some standard CDBG regulations, including the determination of overall benefit and environmental clearances, and modified others, for example, by allowing a more streamlined citizen-participation requirement (Mammen 2011).

In addition to the direct federal aid, in March 2002, Congress authorized seven provisions of tax benefits primarily targeting businesses and economic development projects in the impact area defined as the Liberty Zone in Lower Manhattan (IRS 2014). The Liberty Zone tax benefits were the first geographically targeted tax program authorized by Congress in response to a disaster (GAO 2003). One provision specified that up to $8 billion in bonds could be used to finance the acquisition, construction, reconstruction, and renovation of commercial and residential real property, as well as utilities primarily inside the Liberty Zone, and the interest income on the bonds was exempt from federal taxes (GAO 2003). By 2011, nearly all the Liberty Bonds had been allocated; just over $700 million remained and was earmarked for rebuilding Tower 1 and shops at the WTC site (NYCIBO 2011). About 60 percent of the bonds have been used to rebuild structures on the former WTC site, including Towers 1, 2, 3, and 4 and 7 World Trade Center (NYCIBO 2011).

The State of New York

New York's State Emergency Management Office led the state's emergency response to the September 11 terrorist attacks. It also executed the key FEMA programs authorized by the presidential disaster declaration, including the Public Assistance program.

New York State had some extensive, direct interests in the recovery and rebuilding of Lower Manhattan. Most notably, the World Trade Center had been built and was owned by the Port Authority of New York and New Jersey, a bistate public corporation.[4] The Port Authority was a major partner in the planning and rebuilding of the WTC site. In July 2001, just months before the attacks, the Port Authority had entered into a 99-year lease of the Twin Towers and other WTC buildings with Silverstein Properties, which would also have a major role in the site's reconstruction. The Port Authority also owned and managed the PATH commuter rail line running from New Jersey to Manhattan, and it led the WTC transportation planning process and the rebuilding of the WTC transportation hub. It also led the rebuilding of the September 11 memorial complex and the World Trade Center 5 building and retained one-third ownership of the WTC site, World Trade Center 1 (the Freedom Tower), and World Trade Center 5 once they were completed. It was a major recipient of federal aid via FEMA, HUD, and the DOT, as well as significant state funds.

The MTA, the State Department of Transportation, and the Battery Park City Authority were other state agencies that had damaged property or infrastructure in Lower Manhattan. All of them partnered with city, state, and federal agencies on rebuilding. The MTA and the State Department of Transportation were major recipients of federal aid from FEMA and the DOT. The MTA led the construction of the Fulton Street Transit Center.

In the initial months after the September 11 attacks, there was much speculation about how authority for reconstruction would be managed between New York State and New York City, as well as the federal government and New Jersey State (Mammen 2011; Perez-Pena 2001b). At the end of November 2001, Governor George Pataki, Mayor Rudy Giuliani, and Mayor-Elect Michael Bloomberg together announced the chairman and members of the board of directors of the newly formed Lower Manhattan

Redevelopment Corporation, later renamed the Lower Manhattan Development Corporation (LMDC). The LMDC was established as a subsidiary of New York State's leading economic development agency, the Empire State Development Commission (ESDC). Before 2001, the ESDC had established subsidiaries throughout New York City and the state; notably, the ESDC's 42nd Street Redevelopment Corporation was viewed as a successful state-city partnership that revitalized Times Square.

The LMDC was charged with revitalizing and rebuilding Lower Manhattan south of Houston Street, including overseeing construction and development of the areas affected by the terrorist attacks, transportation and other infrastructure improvements, and the attraction and retention of business in the area. To achieve this, the LMDC, through its parent corporation, the ESDC, was granted a broad array of statutory authority, including the ability to condemn property, issue tax-exempt and non-tax-exempt bonds, and act as an agent for federal subsidies and grants.

After Bloomberg took office as New York City's mayor in January 2002, he and Governor Pataki announced a change in the LMDC's bylaws to expand the board of directors to 16 members, half appointed by the governor and half by the mayor (LMDC 2002b). In early January 2002, the LMDC Board of Directors approved the appointment of Louis R. Tomson as executive director (LMDC 2002a). Tomson had an extensive public service career, mainly in the state government, that included serving as first deputy secretary to Governor Pataki, with responsibility for policy development for the state's more than 60 public authorities. Staffing of the LMDC progressed quickly in the first half of 2002.

In February 2002, the LMDC also formed a general advisory committee composed of government officials, business leaders, and heads of major civic organizations, as well as a series of advisory councils to help provide for public input and participation to the LMDC. At least six advisory councils were eventually formed, each with about 20 members, including two LMDC board members. They included the advisory councils for the Families of September 11th; Residents; Restaurants, Retailers, and Small Business; Arts, Education, and Tourism; Commuters and Transportation; and Development.

Together, the ESDC and the LMDC managed the administration of the three CDBG appropriations totaling $3.48 billion. The ESDC developed the action plan, designed and implemented programs, and administered funds for the first CDBG-DR appropriation of $700 million. The LMDC handled the second and third CDBG-DR appropriations, totaling $2.78 billion, developed the action plans, created programs, and collaborated with other agencies to fulfill implementation (NYCIBO 2011). The programs funded by the CDBG-DR included a residential grant program to encourage residents to remain in, or relocate to, Lower Manhattan ($236.2 million); affordable-housing initiatives ($54 million); a business recovery grant program ($572 million); a Lower Manhattan job-creation and retention grant program ($447 million); planning, land acquisition, site preparation, and construction costs at the WTC site ($842 million);[5] grants to investor-owned utilities to rebuild and enhance Lower Manhattan infrastructure ($483 million); and funds for parks, streetscape and transportation improvements, education facilities, and community and cultural enhancement projects in Lower Manhattan ($600 million) (NYCIBO 2011).

The World Trade Center Project Plan included the creation of a permanent memorial and redevelopment of the 16-acre (6.5-hectare) WTC site and adjacent areas (LMDC 2007). The design concept by Daniel Libeskind for redevelopment of the WTC site was selected in February 2003, and the September 11 Memorial design by architect Michael Arad and landscape architect Peter Walker was announced in January 2004.

In 2004, the LMDC completed the environmental review process on the World Trade Center Project Plan, which, despite several amendments, remains the master planning guide for rebuilding in the WTC area. Mammen (2011) documents the details of the WTC planning process between 2002 and 2004.

Although the LMDC was touted as a city-state corporation, it was technically a state corporation, and the combined management by the LMDC and the ESDC of the CDBG-DR funds gave the state and Governor Pataki a great deal of influence over the planning and rebuilding of the WTC site and many other key aspects of Lower Manhattan's re-

Surrounding buildings are reflected in one of the twin pools at the World Trade Center Memorial Park. Photo by Robert Olshansky (2015).

covery. It also meant that the state legislature was not an essential decision maker or authorizing agent for much of the program development and spending.

In late November 2004, the State of New York and New York City established the Lower Manhattan Construction Command Center to coordinate all the construction projects and construction personnel in Lower Manhattan in order to meet the ambitious rebuilding timeline while minimizing the impact of this construction activity on the community. In May 2005, amid criticism about delays, security, and financial uncertainty of the World Trade Center rebuild, Governor Pataki appointed his longtime chief of staff, John Cahill, to serve as a downtown czar to help oversee and coordinate the state agencies involved in rebuilding and to lead the negotiations with Silverstein Properties and other private developers on the WTC site (Mammen 2011).

New York City

New York City mayor Rudy Giuliani was dubbed "America's Mayor" for his visible leadership in the hours and days after the September 11, 2001, attacks. For a short time, Mayor Giuliani and his supporters considered challenging the city's two-term mayoral limit, and he also lobbied for a three-month emergency extension of the end of his term from January 1 to April 1, 2002 (Perez-Pena 2001a). However, the November 2001 elections proceeded as planned, and it was the next city's mayor, Michael Bloomberg, who provided strong leadership and influence on the rebuilding of Lower Manhattan. Mayor Bloomberg eventually chaired the Memorial Foundation charged with raising funds and managing the September 11 memorial complex, and he provided significant vision and exerted considerable political influence on the complex public-private partnership among the Port Authority, Silverstein Properties, and others involved in the rebuilding of the WTC site.

The New York City Economic Development Corporation oversaw several CDBG-DR programs for business recovery and economic development in Lower Manhattan. The New York Department of Transportation had responsibility for all streets and sidewalks in the WTC site redevelopment and was a major recipient of federal funding to redesign and rebuild these elements. New York City's Department of City Planning and Department of Buildings were involved in land use, zoning, and building construction related to redevelopment of the WTC site. However, because of the Port Authority's status as an interstate agency, which exempted it from normal city development processes, the city's community boards, the city planning commission, and the city council did not control the public hearing and approval processes for the WTC site (Mammen 2011).

In addition to federal aid, New York City also benefited from the state's provision of working capital while it awaited reimbursement for expenses from federal and state agencies. New York State approved a special authorization for the city to borrow $2.5 billion through the New York City Transitional Finance Authority (TFA) (NYCIBO 2011). Debt service was paid from New York City personal income taxes, and the pledge of taxes provided collateral for the bonds. The bonds issued by the TFA allowed the

city to meet its immediate cash-flow needs for cleanup and recovery and were also used to cover general operating expenses in 2003.

NOTABLE RECOVERY FEATURES

Rebuilding the World Trade Center Complex and Lower Manhattan

The LMDC and the Port Authority faced immense criticism over the years as construction costs and timelines were both extended far beyond original estimates. The 2008 financial banking crisis and the subsequent great recession reduced the demand for office space in Lower Manhattan and significantly affected city and state budgets for WTC site redevelopment. In 2008, Mayor Bloomberg called for the LMDC to complete the memorial complex and totally redesign the transit hub and then disband (Bagli 2008). In late 2016, the LMDC remained in operation and was still managing programs defined and funded with federal recovery dollars.

After many rounds of negotiations and reassessments of financial and market realities, the financing and ownership of the commercial components of the WTC complex have shifted, and the Port Authority, the State of New York, and New York City have more financial responsibility than was initially proposed. The overall development cost for the rebuilding of the WTC complex is estimated at $30 billion, despite some downsizing from the original master plan proposed by Daniel Libeskind (WTC 2016).

Seven World Trade Center was the first building in the former WTC complex to be rebuilt; it opened in 2006. In 2011, on the 10th anniversary of the September 11 attacks, the National Memorial was dedicated in a ceremony for the victims' families. The National September 11 Memorial Museum opened on May 21, 2014, and includes 100,000 square feet (9,290 square meters) of exhibition space. Four World Trade Center opened in November 2013, and 1 World Trade Center—the Freedom Tower—opened in November 2014. Work on the $4 billion World Trade Center Transportation Hub was completed in 2016, and the 80-story World Trade Center 3 tower is under construction. Planning and construction of the 88-story World Trade Center 2 tower and the performing-arts center are also under way.

Rising 1,776 feet, World Trade Center Tower 1, or the Freedom Tower, is the tallest structure in the rebuilt World Trade Center complex. Photo by Robert Olshanksy (2015).

Lower Manhattan's economy and functions have also diversified significantly since 2011, in part stimulated by the projects resulting from the federal, state, and local recovery funds and tax credits. Although Lower Manhattan is still one of the world's financial hubs, its economy is also attracting technology, advertising, and media businesses. Hotel and residential units have nearly tripled since 2001, and retail space has expanded by 1.5 million square feet (140,000 square meters) (WTC 2016). Lower Manhattan now boasts a residential population of 61,000 (NYCEDC 2014).

Important Federal Reforms

The September 11 terrorist attacks generated a policy shock wave in Washington, D.C., and across the disaster management field as major political bodies conducted post-disaster investigations into failures of the federal

intelligence and response systems. These examinations identified a need for "a true national response system that can integrate the efforts of local, state, and federal civilian and military response forces" (Harrald 2012, 173). The resulting wave of legislative changes and organizational reforms was relatively swift and dramatically altered the nation's disaster management landscape.

In 2002, Congress created the Department of Homeland Security (DHS), and the DHS secretary was officially designated as the principal federal official to manage domestic incidents. FEMA and many other federal agencies were absorbed into DHS. The Homeland Security Act of 2002 charged DHS with responsibility for consolidating existing federal response plans into one plan, creating an intergovernmental national incident management system (NIMS) to enable seamless communication among responders, and aiding disaster recovery (Harrald 2012; U.S. House of Representatives 2006).

In December 2004, the DHS released the new National Response Plan, which integrated the previous functions of FEMA within a new multi-organizational and all-hazards national framework. The new plan also created many critical new response positions and coordinating bodies, including the required designation of a primary federal official as an on-scene representative of the president, in addition to the FCO. Together, NIMS and the National Response Plan created, for the first time in the United States, one disaster management structure and doctrine for all levels of response organizations to follow.

The 2004 National Response Plan also instituted two new emergency support functions (ESFs). One of those, ESF-14, Long-Term Community Recovery and Mitigation, was the first explicit initiative by FEMA to systematize federal agency support of long-term community recovery in disaster-affected communities and states. FEMA used it to help empower communities to determine their own recovery needs through a post-disaster process of "establishing a community-based, post-disaster vision and identifying projects and project funding strategies best suited to achieve that vision, and employing a mechanism to implement those projects" (FEMA 2005, 5).

After the September 11 attacks, the DHS and FEMA also launched catastrophe planning efforts across the country. One conducted in Baton

Rouge, Louisiana, in July 2004, centered on the New Orleans metropolitan region and known as the Hurricane Pam exercise, was designed to respond to a slow-moving, category 3 hurricane that produced over 20 inches (0.5 meters) of rain, resulting in 10 to 20 feet (3 to 6 meters) of flooding in New Orleans, over 50,000 fatalities and 100,000 casualties, 1 million homeless metropolitan-region residents, and damage to or destruction of 80 percent of structures in 13 parishes (Louisiana counties) (McQuaid and Schleifstein 2006). The final report on the exercise recommended numerous reforms and outlined the basic lines of responsibility, resource allocation, and response time frames for future storms. After the exercise, smaller groups continued to meet until the 2005 hurricane season. The Hurricane Pam exercise is credited with having helped train responders to do many things that were done very well in Hurricane Katrina.

THE 2005 HURRICANES KATRINA AND RITA

The 2005 storm season was the most active in recent U.S. history, with 27 named storms, of which 15 reached hurricane strength. But it was the 11th named storm of the season, Hurricane Katrina, that substantially tested the new national response system and the value of the great investment that had been made since 2001 to ensure that the nation was capable of dealing with a catastrophic event.

Katrina became a named storm on August 24, 2005, and passed over southern Florida with category 1 hurricane–strength winds on the evening of August 25. National, state, and local emergency preparations and massive evacuations ensued over the next few days until Katrina made landfall near Buras, Louisiana, on the morning of August 29, 2005. After grazing the Louisiana coastline with category 3 hurricane–strength winds and a category 5 hurricane–strength storm surge, it came onshore again near Pearlington, Mississippi, a few hours later and maintained hurricane-intensity winds almost 100 miles (161 km) inland.

In Mississippi, Hurricane Katrina directly affected more than a third of the state's 3 million residents. Many Louisiana residents who had evacuated northward into Mississippi were also caught in the storm's path. Across Mississippi, there were more than 230 deaths, and over 60,000

homes were seriously damaged or destroyed (Office of Governor Haley Barbour 2009). Much of that damage was concentrated in three coastal counties (Hancock, Harrison, and Jackson), where storm surges of up to 26 to 28 feet (7 to 8.5 meters) hit structures, infrastructure, and the natural environment and penetrated inland at least 6 miles (9.7 km) (NWS 2006).

In southeast Louisiana, storm surges of 10 to 15 feet (3 to 4.6 meters) inundated low-lying coastal areas. Breaches in the massive hurricane protection system of levees and flood walls around the New Orleans metropolitan area began on August 29, and within a few days, floodwaters inundated more than 80 percent of the city of New Orleans.[6]

Less than a month later, on September 24, 2005, Hurricane Rita made landfall in Sabine Pass, Texas, near the Louisiana border. In Louisiana, the worst of the storm's wind-related damage occurred in the western part of the state, but another wave of flooding inundated low-lying areas along the Louisiana coast, including parts of New Orleans. Also, the sixth major hurricane of the 2005 season, Hurricane Wilma, made landfall in southern Florida on October 24, 2005. Although it did not affect Louisiana, it did add to the recovery costs and challenges of the very destructive 2005 hurricane season.

Together, Hurricanes Katrina and Rita caused over 1,800 deaths, destroyed over 300,000 housing units, and affected 400,000 jobs, including one of the region's major employers, the oil and gas industry (GAO 2007). The Congressional Budget Office estimated capital losses from Hurricanes Katrina and Rita at $70 billion to $130 billion, and other estimates were over $150 billion (GAO 2007). Private insurers paid out over $46 billion for claims related to these two storms and more than $57 billion for claims related to the entire 2005 hurricane season (III 2016). In addition, the NFIP paid out over $16.7 billion for flooding claims related to these two storms (King 2013). By nearly every measure, Hurricane Katrina was the most destructive and costliest natural disaster in American history, and some estimate that Rita was the third-costliest U.S. disaster at the time.

Within Louisiana, 2 million residents in 22 parishes were affected by the two storms, which killed more than 1,100 people, displaced 785,000 residents, and caused over $150 billion in statewide losses (LRA 2010). An estimated 215,000 homes and 81,000 businesses were damaged, and ex-

tensive damage to educational and health facilities and public infrastructure disrupted commerce nationwide and resulted in the loss of 220,000 jobs across the state (Kopplin 2007). The storms also caused massive environmental damage. An estimated 217 square miles (562 square kilometers) of coastal land were destroyed, and the impact on the state's agriculture, forestry, wildlife, fishing, and recreation industries exceeded $1 billion (LRA 2010).

In New Orleans, Katrina's flooding initially displaced over 90 percent of the city's approximately 455,000 residents. Over 80 percent of all buildings in the city sustained some damage from wind and water, and more than 100,000 households (50 percent of the city's total) had more than 4 feet (1.3 meters) of floodwater (UNOP 2007).[7] Much of New Orleans's infrastructure and economic, institutional, and social systems were damaged or destroyed; most of them were already fragile in 2005 after decades of population and economic decline, sprawling development patterns, and underinvestment. The damage only added to the blight conditions caused

As seen in October 2005, storm surges and levee failures from Hurricane Katrina flooded homes and cars throughout New Orleans and neighboring St. Bernard Parish. Photo by Laurie Johnson (2005).

by an estimated 40,000 vacant lots or abandoned residential properties in the city before the storm (UNOP 2007).

Within two months, most of New Orleans was dewatered, with the exception of the Lower 9th Ward, but over half of the city's households were still without power. The majority of the remaining residents lived in the higher-elevation areas of the city along the Mississippi River. Outside downtown and the French Quarter, the city was nearly empty. The city's six major universities closed for the fall semester, displacing 44,000 students (Konigsmark 2006). By January 2006, best estimates suggested a population of 135,000, and only a few of the city's public schools were open (GCR and Associates 2007). By July 2006, estimates were that about half (223,388) of the city's former population had returned; by July 2007, the city's estimated population was 288,113 (GNOCDC 2009).

ORGANIZING FOR RECOVERY

Much has been written about the Katrina-related failures and problems of emergency response and relief at all levels of government. Some of the key challenges arose from a lack of familiarity with the new National Response Plan and its first full-scale implementation in the 2005 hurricane season, as well as the broader challenges of such a large-scale, multistate coordination effort after Hurricanes Katrina and Rita (DHS 2006; Harrald 2012).

The Federal Government

The presidential disaster declaration area for Hurricane Katrina covered 90,000 square miles (230,000 square kilometers) across parts of Florida, Louisiana, Mississippi, and Alabama. The declarations were revised multiple times to expand the number of declared localities and types of assistance available and reduce the percentage of assistance funded by state cost sharing. Nearly every state in the nation and the District of Columbia received emergency declarations to support Hurricane Katrina evacuees. Major disaster declarations were issued for parts of Louisiana and Texas in response to Hurricane Rita, and for parts of Florida in response to Hurricane Wilma.

In all, the federal government committed more than $110 billion in response and recovery assistance for the 2005 hurricanes (GAO 2007). There were six federal supplemental disaster appropriations, the first two of which came quickly in September 2005 and totaled $62.5 billion in aid directed to emergency and short-term needs. Federal funding for rebuilding housing and infrastructure did not come until a third supplemental appropriation of $29 billion was passed on December 23, 2005, which included $11.5 billion in HUD CDBG-DR funds, $2.9 billion for levee repairs, and $2.75 billion to repair roads and bridges. In late December 2005, Congress passed and the president signed the Gulf Opportunity Zone Act of 2005, which, like the Liberty Zone tax benefits, provided a range of tax incentives for individuals and businesses in the 2005 hurricane disaster declaration areas (GAO 2008c).

On January 24, 2006, the federal administration announced that it would use the HUD CDBG-DR program to distribute federal rebuilding funds to the states in order to ensure more localized control (Walsh 2006). It also prescribed that the CDBG-DR funding would mainly be used to fund residential homeowners to repair damaged housing. Additional supplemental appropriations for HUD CDBG-DR funds and other disaster recovery funding were included in defense spending bills approved on June 15, 2006, and November 13, 2007. FEMA HMGP funding to elevate repaired and rebuilt housing and improve the resilience of repaired and rebuilt public facilities and infrastructure across the Gulf Coast was also provided. Congress's passage of the 2007 Water Resources Development Act provided funds for long-term hurricane flood-protection projects across the region.

The recognition that large sums of federal funding would be necessary for recovery after the 2005 hurricanes, coupled with awareness of the legacies of corruption in Louisiana, stimulated calls from Capitol Hill, former politicians, the news media, and others for Congress and the president to exercise caution and ensure strict accountability and oversight of the funding. Some members of Congress recommended the appointment of a cabinet-level czar to administer the federal recovery programs, and several models were proposed.[8]

On November 1, 2005, President Bush halted the debate by issuing Executive Order 13390, which created the position of coordinator of federal

support for the recovery and rebuilding of the Gulf Coast region (White House 2005). President Bush selected Donald Powell, a former Texas banker and the chair of the board of directors of the Federal Deposit Insurance Corporation, for the position, which reported to the secretary for homeland security. To support the position, the Office of the Federal Coordinator for Gulf Coast Rebuilding (OFC) was created within the DHS. The OFC maintained a small staff of 26 people or fewer, with offices in the Gulf Coast and Washington, D.C. Both the OFC and the federal coordinator were given a broad mandate to lead the process of developing principles to govern the federal recovery efforts; serve as the principal point of contact among the executive branch, Congress, and key stakeholders; and monitor the implementation of specific recovery policies (GAO 2009b).

FEMA also established the position of deputy director for Gulf Coast recovery to manage its efforts and coordinate FEMA program delivery to the five states. Under the new organizational structure, the FEMA deputy director for Gulf Coast recovery was responsible for field implementation of FEMA's traditional recovery and mitigation programs for Hurricanes Katrina and Rita, while the OFC coordinated the long-term recovery of the Gulf Coast region among all federal departments and programs.

Over its four and one-half years of existence, the OFC is credited with providing cross-agency coordination and intervention in program-specific issues to remove recovery obstacles; providing a central hub for collecting recovery information and disseminating it to federal, state, and local stakeholders; encouraging federal- and state-level stakeholders to make decisions on stalled recovery projects; and raising recovery issues to top administration officials and advocating for policies and funding (GAO 2009b). It also received considerable criticism for lacking decision-making, funding, and statutory authority and influence, given its indirect reporting relationship to the president; overstepping its coordination role among federal agencies; and interfering inappropriately in the administration of specific federal recovery programs for which it lacked specific knowledge and experience.

The State of Mississippi

Within weeks of Katrina's landfall, Mississippi governor Haley Barbour appointed the Commission on Recovery, Rebuilding, and Renewal, a privately funded, nonprofit organization in which over 40 local officials and business leaders served as chairs and committee leaders (Governor's Commission on Recovery, Rebuilding, and Renewal 2005). It was supported by a small staff of about 10 people but also included over 500 volunteers serving on numerous committees.

In mid-October 2005, the commission held a six-day meeting, called the Mississippi Renewal Forum, with teams of local and out-of-state professionals working alongside community leaders to design and plan for the Gulf Coast (Mississippi Renewal Forum 2005). The commission then processed input from the forum and developed its final report, titled "After Katrina: Building Back Better than Ever," which was released on December 31, 2005, and contained over 230 recommendations in a variety of areas, including infrastructure, economic development, and human services (Governor's Commission on Recovery, Rebuilding, and Renewal 2005). The commission effectively ended at this point, but its work and recommendations were instrumental in shaping the state's recovery agenda.

In early 2006, the Mississippi legislature and the governor established the Governor's Office of Recovery and Renewal to design the state's various recovery programs and shape its overall approach to rebuilding (GAO 2009a; G. Smith 2011). Among its responsibilities, the office coordinated recovery efforts among federal and state agencies, specifically the Mississippi Development Authority (MDA) and the Mississippi Emergency Management Agency (MEMA), and other public and private entities. Its primary objectives included obtaining as much federal funding as possible and maximizing the use of credit in lieu of cash, advising the governor and state agencies and formulating policies, providing technical assistance and outreach to local governments, and facilitating the implementation of recommendations made by the Governor's Commission (G. Smith 2011). The office issued annual reports with updates on the state's recovery efforts (Office of Governor Haley Barbour 2009).

Mississippi received about $5.5 billion in federal CDBG-DR funds provided through three congressional allocations in 2005, 2006, and 2007. The Disaster Recovery Division was established in the MDA to manage the CDBG-DR funds and implement policies established by the Governor's Office of Recovery and Renewal. The Disaster Recovery Division initially had a staff of about 20 people and eventually grew to about 50 employees (GAO 2009a). Contractors were also hired as needed to handle the day-to-day management of key recovery programs, such as the state's housing grant program. Mississippi's CDBG-DR funds were mainly directed to housing recovery, infrastructure, and economic development projects.

The MDA Disaster Recovery Division continues to administer and provide federally required monitoring of the CDBG-DR funds. MEMA continues to collaborate with FEMA on the administration of funds within the state. As of July 2015, FEMA had provided more than $1.3 billion in Individual Assistance funds in Mississippi and $3.1 billion in FEMA Public Assistance funds to rebuild Mississippi's infrastructure and reimburse the state for emergency measures after Hurricane Katrina (FEMA 2015b).

The State of Louisiana

Early in September 2005, Louisiana governor Kathleen Blanco began organizing for long-term recovery. The governor's office helped establish a mechanism for receiving donations, which eventually led to the creation of the Louisiana Disaster Recovery Fund, and with the assistance of Stefan Pryor, executive director of the Lower Manhattan Development Corporation, Louisiana leaders began to design a state-level organization to oversee recovery (Olshansky and Johnson 2010).

On October 17, 2005, Governor Blanco issued an executive order to create the Louisiana Recovery Authority (LRA) and charged it with securing funding and other resources, establishing principles and policies for redevelopment, leading long-term community and regional planning efforts, ensuring transparency and accountability, and communicating progress, status, and needs of the recovery to officials, community advocates, and the public (Blanco 2005; LRA 2010). Until the Louisiana legislature formalized the LRA on February 23, 2006, it operated out of the governor's

office. The LRA's first employee and founding executive director was the governor's chief of staff, Andrew Kopplin.[9] Over time, the organization developed a small staff of about 20 to 30 professionals in administration, communications, intergovernmental affairs, policy, and planning, many of whom came from other state agencies. It also outsourced work to consultants as needed.

The LRA was led by a board of directors whose 33 members were selected to be bipartisan, socioeconomically and racially diverse civic and national leaders who originated from affected communities. These volunteers met consistently nearly every month over the five-year life of the LRA, and the agency issued quarterly reports on its work, as required by the Louisiana legislature. The LRA also formed a series of task forces to develop and guide policy for a host of recovery issues, including housing, economic and workforce development, infrastructure and transportation, public health and healthcare, the environment, human services, education, coastal protection, and long-term community planning.

Although the structure of the board and the task forces was loosely modeled on the Lower Manhattan Development Corporation, the LRA functioned as a coordinating and planning body for the State of Louisiana. It established spending priorities and plans that were subject to approval of the state legislature. After developing the general program design, LRA staff typically coordinated with federal funding agencies and other state agencies that served as recipients of the funding and implemented and managed various recovery programs.

Two key recovery program management agencies were the Louisiana Office of Community Development (OCD) and the Governor's Office of Homeland Security and Emergency Preparedness (GOHSEP). The Louisiana OCD established the Disaster Recovery Unit with lead responsibility for the administration of the CDBG-DR funds; GOHSEP had lead responsibility for administration of the FEMA programs. To supplement staff, contractors were hired as needed, many of whom handled the day-to-day management of key recovery programs.

The LRA defined priorities for both short- and long-term recovery issues and developed spending plans for $13.4 billion in CDBG-DR funds for Hurricanes Katrina and Rita. The OCD mostly implemented and

managed the resulting programs and services (LRA 2010). Similarly, the LRA established priorities for over $1.15 billion in FEMA HMGP funding after the 2005 hurricanes (LRA 2010), but GOHSEP maintained responsibility for the management of other FEMA programs. However, the LRA worked with GOHSEP and FEMA to identify ways to streamline the Public Assistance process and also advocated for regulatory and administrative policy changes (Rainwater 2009).

The LRA's spending priorities for the CDBG-DR and FEMA HMGP funds were housing, economic development, and infrastructure rebuilding, and it provided leadership for long-term recovery planning across the state. Even after the priorities were set, however, the process of obtaining and spending the federal recovery dollars was frustrating and contentious for Louisiana state officials, especially during the first years of recovery. In congressional testimony, state officials cited numerous examples of federal regulations that were hampering the state's abilities to more expeditiously structure and implement recovery programs (Fraiche 2007; Kopplin 2007; Rainwater 2009). The LRA's executive director noted, "The constant haggling required by state and local officials to secure resources, eliminate red tape, and secure waivers and extensions has led to uncertainty that has slowed the recovery and undermined public confidence" (Kopplin 2007, 2).

In January 2008, newly elected governor Bobby Jindal issued an executive order expanding the LRA's oversight to include FEMA Public Assistance and HMGP funds, as well as HUD CDBG-DR funds, an action that was later approved by the Louisiana legislature (LRA 2010).[10] Governor Jindal also appointed Paul Rainwater as LRA executive director and as the governor's authorized representative for the state's FEMA and HUD disaster recovery programs. This appointment provided better alignment and closer coordination across the programs and improved the working relationship between the state and the federal government. In all, the state of Louisiana received approximately $72.5 billion in federal recovery funds, about half of which was used to fund immediate disaster relief, while $35 billion was available for long-term rebuilding (LRA 2008). By September 2008, $50.9 billion of the federal funding had been spent, and an estimated $4.6 billion in state funds had also been dedicated to recovery (LRA 2008).

In September 2008, Hurricanes Gustav and Ike struck much of the state, resulting in 51 deaths, over 12,000 flooded homes, and as much as $20 billion in physical damage, including $1.7 billion in uninsured housing losses (LRA 2010). In addition to the Stafford Act–related programs, Congress appropriated $1.058 billion in CDBG-DR funds to Louisiana, and the LRA set the funding priorities for its use. More than half ($565.5 million) was apportioned to the 53 affected parishes for a menu of housing, infrastructure, and economic development programs that they could choose to implement. The remaining funds helped state-led programs for affordable rental housing; assistance to businesses, agriculture, and fisheries; infrastructure; and coastal restoration (LRA 2010).

The LRA ceased operation on June 30, 2010, the sunset date originally prescribed in its establishing legislation. The staff of the LRA merged with the OCD's Disaster Recovery Unit, which continues to administer and provide federally required monitoring of the CDBG-DR funds. It also continues to work with GOSHEP on the administration of FEMA disaster-related funds.

The City of New Orleans

Before Katrina's landfall, New Orleans city managers set up an emergency operations center in a hotel across from city hall, but once the flooding started, much of the senior staff temporarily relocated to Baton Rouge. After a few weeks, the core staff returned to city hall, and the office of the city's chief administrative officer (CAO) became the hub of federal, state, and city recovery activities. Throughout the recovery, the CAO's office and its Capital Projects group oversaw most of the city's insurance claims and FEMA-related activities, particularly its Public Assistance applications.[11] The Departments of Building Permits and Safety and Public Works were also active in recovery.

On September 30, 2005, Mayor C. Ray Nagin announced the formation of the 17-member Bring New Orleans Back (BNOB) Commission and charged it with overseeing the development of a rebuilding plan for New Orleans by the end of 2005. The New Orleans City Council also created an

ad hoc recovery committee to screen and package recovery-related items for the full council's consideration.

In early October, shortly after Hurricane Rita, Mayor Nagin announced that the city would be making drastic budget cuts because of a considerable reduction in sales and property tax receipts after the storms and anticipated declines in other revenue sources; neither the state nor the federal government had promised loans or major grants. Cuts after the storm reduced citywide operations by 30 to 60 percent and the administrative workforce (excluding public safety positions) by 50 percent (City of New Orleans 2006). The city's bond rating was also downgraded and the city was no longer able to sell voter-approved bonds.

Olshansky and Johnson (2010) chronicle the post-disaster recovery planning efforts in New Orleans during the first two years of recovery. The BNOB Commission's controversial report, released in January 2006, endorsed the idea of shrinking the city's urban footprint and replacing certain low-lying neighborhoods with green space (Nagin and BNOB 2006). It also recommended that more detailed, neighborhood-based planning be conducted to evaluate the long-term viability of heavily damaged neighborhoods; that a moratorium be placed on the issuance of new building permits until that planning process was completed; and that a New Orleans recovery corporation be created to oversee the city's recovery. Under strong community pressure, Mayor Nagin rejected the BNOB report, but the concept of neighborhood-based planning endured. Planning efforts led by the New Orleans City Council, FEMA's ESF-14 plan for Orleans Parish, and numerous neighborhood and academic groups ensued in 2006 and were also considered in subsequent planning efforts.

In late August 2006, Mayor Nagin, the New Orleans City Council, the New Orleans City Planning Commission, and the LRA signed a memorandum of understanding to support the development of the philanthropically funded Unified New Orleans Plan (UNOP), which produced both the Citywide Strategic Recovery and Rebuilding Plan (UNOP 2007) and a series of district recovery plans for each of the city's 13 planning districts (administrative areas delineated by the city planning commission during the 1980s). In all, UNOP identified 95 priority recovery projects totaling more than $14.3 billion to be completed over a 10-year period. These proj-

ects filled the gaps in the estimated $40 billion in public and private funds already allocated to New Orleans's recovery. The UNOP citywide and district plans were officially submitted to the city planning commission on January 30, 2007.

As UNOP was being completed, Mayor Nagin reorganized New Orleans's city government and established the Office of Recovery Management (ORM)—the first management organization focused on recovery within city government. The mayor charged it with delivering technical solutions and management to the recovery effort and overseeing the financing and implementation of all public recovery initiatives. The ORM began operation in January 2007 and geared up over the next year to a staff of about 20, assembled from city departments and from outside city government. Philanthropic organizations helped supplement the city's funds for the staff.

While the UNOP review was under way, the ORM developed a recovery planning implementation vision that it released on March 29, 2007. The City of New Orleans's Target Area Plan identified $1.1 billion in obtainable funding sources and proposed to use public recovery funds in 17 recovery zones located in business corridors around the city to spur redevelopment and private investments and also enhance quality of life in these areas. Also, during this period, the New Orleans City Council passed an ordinance adopting a program known as "Lot Next Door" that allowed homeowners to purchase publicly owned lots adjoining their own lots before these were offered to other buyers.

The ORM and city planning commission staff packaged the Target Area Plan and the UNOP plans into the New Orleans Strategic Recovery and Redevelopment Plan, which the city council and the LRA approved in June 2007. At its meeting, the LRA allocated $117 million of CDBG-DR funds to New Orleans for recovery projects in the 17 target areas.

As the review and approval process for the New Orleans Strategic Recovery and Redevelopment Plan was nearing completion, in May 2007, the New Orleans City Council granted authority to the New Orleans Redevelopment Authority (NORA) to expropriate abandoned or blighted properties in the 17 target areas, as well as in other parts of the city, if rigid criteria could be met (Donze 2007). Mayor Nagin had begun revamping NORA

in late 2006 with a new and more influential board of directors, enhanced authority and funding, and a new executive director (Winkler-Schmidt 2007). NORA hired a staff of redevelopment specialists and began developing new rules, procedures, and internal controls for acquiring and disposing of properties, implementing the council-approved Lot Next Door program, becoming the agent for the City of New Orleans to receive properties purchased by the state's Road Home program, and reshaping itself to undertake more residential and commercial development and redevelopment, particularly affordable housing (Winkler-Schmidt 2007). Because of the lack of any meaningful funding from the city and the delays in allocations of recovery funding, the agency had to tap into its reserves and turned to philanthropic organizations for funding support.

On September 27, 2007, the ORM released its draft Target Area Development Plan, that more specifically identified the public facilities, housing, commercial, parks and recreation, and infrastructure projects in each of the 17 target areas, as well as critical citywide education and innovation, public facility and institution, and environmental projects (City of New Orleans 2007). But because the ORM was largely a planning and policy advisory office to the mayor, it had to collaborate with other city agencies, such as the CAO's office, which was handling the FEMA Public Assistance application process, and Economic Development, which had access to non-disaster CDBG funds, to help fund the projects.

In October 2007, the ORM merged with other city agencies to become the Office of Recovery Development and Administration (ORDA). In addition to the former ORM, the ORDA included the former departments and agencies of Economic Development, Workforce Development, Housing and Neighborhood Development, Code Enforcement, and Safety and Permits, the Historic District Landmarks Commission, the Vieux Carré Commission, and the city's offices of Business Retention and Arts and Tourism. It was anticipated that this merger could help the city more effectively define specific recovery projects and develop and bundle appropriate program and policy responses to implement the Strategic Recovery and Redevelopment Plan, including the city's non-disaster and disaster-related CDBG funds.

The locations of 17 areas targeted for recovery investments are identified in the City of New Orleans Target Area Development Plan, Draft, September 27, 2007. *Source*: City of New Orleans (2007).

In December 2007, the LRA confirmed that the city's CDBG-DR allocation would be increased to $411 million, including $150 million for economic development. The ORDA worked to structure the process, applications, and plans for use of these funds. The LRA also embedded staff members within the city to increase strategic planning capabilities, assist in streamlining state program requirement reporting, and help speed up the city's implementation of recovery projects. The ORDA also worked with other parish-wide agencies and FEMA to secure Public Assistance program funding, where applicable, for critical recovery projects and to integrate the recovery projects into the city's capital budgets. The city also now had access to $200 million in bond funds established by the State of Louisiana for the city to pay recovery project–related costs until it obtained reimbursements from FEMA's Public Assistance program (OIG 2010).

To help increase its project management capacity to deal with an unprecedented volume of recovery projects, the city also established the Project Delivery Unit (PDU) under the coleadership of the ORDA and the CAO's office to manage an integrated program for repair and rehabilitation of city-owned buildings, facilities, and streets (Blakely 2012). The PDU was composed of personnel from the ORDA, the CAO's capital projects group, and the Public Works Department, and an outside contractor was hired to manage the 394 capital projects, with work that included project scoping, supervision of architects in project design, and putting the projects out for bids (OIG 2010).[12]

The ORDA also developed guidelines and financing programs to help homeowners improve blighted property conditions and to redevelop the estimated 40,000 pre- and post-storm abandoned and blighted properties across the city (Holbein 2009). In early 2008, the city launched an enhanced code enforcement program to combat blight and give the city the power to institute fines and, in the worst cases, seize a property for demolition or resale.

In December 2007, the city council and the State of Louisiana approved NORA's redevelopment and disposition plan to become the lead agency to manage the 7,000 properties sold to the state through the Road Home program (NORA 2007). NORA's plan focused on making properties available for sale to adjacent property owners through the city's Lot Next Door program; bundling Road Home properties with other city-owned tax-delinquent and adjudicated properties for rapid redevelopment to create more affordable housing and promote economic growth; creating community gardens and other alternative uses on hard-to-sell lots; and ensuring community participation in the planning process (NORA 2007). The city council also approved over $8 million in funding to cover NORA's outstanding expenses and undertake the work of assembling non–Road Home properties in the city's 17 target zones and around the proposed site of a new biomedical and hospital complex (Winkler-Schmidt 2007).

Thus, by the end of 2007 (over two years after Katrina's landfall), New Orleans's recovery governance structure was finally in place; the ORDA and the PDU were leading the charge on recovery project design, implementation, and funding, and NORA was leading on land reuse and rede-

velopment. But even though the recovery implementation pipeline was established, funding was still slow to come. Together, the ORDA and NORA were working to embed hazard mitigation into the recovery: elevating buildings, purchasing permanent open space in low-lying areas, obtaining public title to flood-prone lands through land swaps, and improving construction techniques.

Funding for recovery continued to trickle into the city throughout 2008. By October 2008, the city was managing $1.1 billion in recovery projects, 73 percent of all planned projects were under way, and the city was expecting to receive and control about $2 billion in funding (City of New Orleans 2008). This was far less than the $14.3 billion of recovery needs estimated by UNOP. FEMA had allocated only $353 million in Public Assistance funds, about half of which was reimbursement for response-related activities, and the city had received less than $10 million of the state's $411 million in CDBG-DR funds allocated to the city (City of New Orleans 2008).

At the end of 2008, both New Orleans's and the state's economies were showing signs of recovery and strength. The city's sales, hotel and motel, and motor vehicle taxes were at 96 percent of pre-Katrina values, and the Port of New Orleans had exceeded its pre-Katrina volume and expected to be at 80 percent of its pre-Katrina cruise-line business by the end of 2009 (City of New Orleans 2008). As the rest of the country plunged into recession, New Orleans's real estate market and economy remained relatively strong, buffered in large part by recovery-related construction and the Gulf Coast's thriving petroleum sector (Liu and Plyer 2009). A variety of large public and private recovery projects had been initiated, including the redevelopment of public housing sites and a new medical campus of Louisiana State University, Tulane University, and the U.S. Veterans Administration hospital. *Business Week* named New Orleans one of the 10 "Safest Cities in Which to Ride-Out the Recession" (GNO Inc. 2010).

The optimism translated into a general view among residents and leaders that it was time to move beyond disaster recovery. In November 2008, New Orleans voters approved two important amendments to the city charter (Liu and Plyer 2009). The first gave the city's master plan teeth by requiring all zoning and land use requirements to conform to it. This

provided predictability, market confidence for development, and a more transparent and organized process for public participation. The second measure authorized a dedicated revenue source for the Inspector General's Office created after Katrina, giving it the steady resources necessary for accountability in the wake of pervasive public mistrust, waste, and fraud.

In September 2009, months before the end of his second term, Mayor Nagin dissolved the ORDA. The ORDA departments dealing with housing and economic development became part of the new Office of Community Development, and the PDU continued to oversee the city's recovery projects. On February 6, 2010, New Orleans elected a new mayor, Mitch Landrieu, who structured his leadership team as a series of deputy mayors.[13] Many of the former agencies and departments that had been part of the ORDA, as well as most of the city's ongoing recovery projects and funding from the FEMA PA and CDBG-DR programs, were placed under the leadership of the deputy mayor for facilities, infrastructure, and community development.

The 2010 census confirmed that New Orleans's population was now over 70 percent of its 2000 level, but blight remained the most visible evidence of Katrina's wrath. Mayor Landrieu announced an aggressive blight-reduction strategy in October 2010 with an ambitious goal of reducing the blight count in New Orleans by 10,000 units by 2014, which the city exceeded by January 2014 (City of New Orleans 2014).[14] In 2010, NORA was awarded $30 million in federal stimulus funds directed to HUD for the Neighborhood Stabilization Program (NSP) to help stabilize communities that had suffered from foreclosures and abandonment as a result of the great recession (Hammer 2010). NORA joined with 10 nonprofit and neighborhood organizations to restore housing stock and build new affordable housing in key neighborhoods hit hard by Hurricane Katrina. In 2014, NORA was engaged in the final stages of a second NSP project focused on providing financing for over 470 units of affordable housing across the city, promoting commercial redevelopment, and undertaking a third wave of the city's successful Lot Next Door program (City of New Orleans 2014).

In April 2010, New Orleans and Louisiana faced yet another challenge. The explosion of the Deepwater Horizon oil rig claimed 11 lives and poured millions of barrels of oil into the Gulf of Mexico. Temporary moratoriums

on offshore oil leases and drilling and impacts on fisheries and wildlife, many of which were long term, all negatively affected the economies of New Orleans, Louisiana, and the Gulf Coast.

Since 2010, the national economy has improved, and so has the availability of private capital and community investment opportunities in New Orleans. The city earned back an investment-grade bond rating from each of the rating agencies in 2009, which strengthened public investment in infrastructure. New Orleans' *Plan for the 21st Century,* commonly referred to as the New Orleans 2030 Master Plan (City of New Orleans 2010) and the Greater New Orleans Urban Water Plan (Waggoner and Ball Architects 2013) are helping guide new investment and growth. The city also adopted a new comprehensive zoning ordinance in 2015.

In 2014, New Orleans residents reelected Mayor Landrieu to a second term and witnessed the conviction of former mayor Nagin on 20 counts of corruption-related crimes and given a 10-year prison sentence. Nagin's crimes involved bribery and helping businesses secure no-bid contracts from the city as part of its recovery program. For many residents and government officials, the mayor's conviction undermines the value of all the hard work done by so many in the city's first years of recovery; for others, it is an affirmation of doubts they had from the moment Katrina struck whether the City of New Orleans could ever be trusted to manage large sums of federal recovery and rebuilding funds.

NOTABLE RECOVERY FEATURES

Post-Disaster Recovery Planning

The 2005 hurricanes marked the first real use of the National Response Plan's ESF-14 Long-Term Community Recovery and Mitigation program. In 2005 and 2006, FEMA, along with a cadre of planning contractors, worked with communities across the Gulf Coast disaster-affected region, typically in a 6- to 12-week intensive planning process, to develop a post-disaster vision, identify recovery projects and project funding strategies best suited to achieve that vision, and employ a mechanism to implement those projects (FEMA 2005).

In Louisiana, the FEMA ESF-14 community recovery plans were designated as the parish-planning component of the state's long-term community planning initiative, known as Louisiana Speaks.[15] Initially funded by private foundations, including the Rockefeller Foundation, the Louisiana Speaks program was overseen by a long-range community recovery planning task force established by the LRA board, as well as urban planning staff hired by the LRA. The program defined a set of recovery planning principles with which all parishes in the state had to comply. Each parish had to submit its recovery plan to the LRA for review and acceptance, and the LRA then allocated $700 million in CDBG-DR funds for public facilities and infrastructure repairs and community improvement projects to parishes with LRA-accepted, long-term community recovery plans. After this, the LRA, together with the OCD, developed the three-year, $3 million Parish Planning Capacity Building Program, which covered the cost of hiring a full-time planner to design

This rebuilt home sits next to the repaired 17th Street Canal, which failed during Hurricane Katrina and flooded the adjoining Lakewood district of New Orleans. The empty lot next door is likely owned by the adjoining homeowner and purchased under the Lot Next Door program, which allowed homeowners to purchase publicly owned lots adjoining their own land before the lots were offered to other buyers. Photo by Laurie Johnson (2014).

and implement recovery programs in the 13 hardest-hit parishes (LRA 2010).

The LRA also led a regional planning process for southeastern Louisiana that was completed in May 2007. The Louisiana Speaks Regional Plan emphasizes smart growth and investment in coastal restoration and also advocates for thinking regionally about economic development to create a more stable and robust economy (LRA 2007).[16] Its extensive citizen-participation component included a balloting process in 35 parishes, as well as a web-based poll and phone survey. It specifically cites support for other key plans, including the development of a master plan for the newly created Louisiana Coastal Protection and Restoration Authority and New Orleans's recovery plan.

Large-Scale Housing Repair Programs

Mississippi and Louisiana used large portions of the CDBG-DR funds for housing repairs. Mississippi directed nearly 70 percent ($3.85 billion) of its CDBG-DR funds to housing recovery (Office of Governor Haley Barbour 2009). The Mississippi Homeowner's Assistance Program paid more than $2 billion in individual grants to over 27,750 homeowners and provided over 1,100 home-elevation grants totaling $46.5 million. A small rental program ($226.9 million) helped fund repairs to over 4,000 rental housing units; a long-term workforce-housing program ($329.5 million) helped fund rehabilitation, new construction, and homebuyer assistance for more than 1,700 affordable housing units; and a tax-credit program ($25 million) helped facilitate construction of 700 affordable housing units. An insurance rate management program ($440 million) was also established to help to offset increased residential insurance costs after Katrina.

Louisiana's $10 billion housing program, called the Road Home, paid more than $8.53 billion directly to approximately 128,000 homeowners to make repairs or to sell the property to the state (LLT 2015; LRA 2010). This included more than $876 million from a combination of CDBG-DR and FEMA HMGP funds to elevate homes. Approximately 9,800 homeowners opted to sell their homes to the state, almost half of which were located in

Orleans Parish and had added to the city's pre-storm blight challenges. The Louisiana legislature formed the Louisiana Land Trust as a nonprofit organization responsible for managing all the properties purchased under the Road Home Program with broad powers to receive and dispose of properties, accept funds from any sources, borrow against properties, and obtain payment for these obligations.[17] Also, a $521 million rental housing program combined CDBG funds with investment tax credits to subsidize affordable housing units as part of larger market-rate projects. A piggyback program used $333 million to create 6,237 rental housing units, including 4,226 affordable units. A small rental program paid $158.4 million directly to landlords to repair about 6,000 rental units.

Important Federal Reforms

In the aftermath of the 2005 hurricane season, numerous federal and state agencies, academic institutions, and media organizations launched investigations into the failings of the local, state, and national responders. The post-Katrina studies concluded that there was an absence of strong leadership, and that the subordination of FEMA to DHS after the 2001 terrorist attacks and the focus on terrorism had severely affected the nation's capability to respond to natural disasters (U.S. House of Representatives 2006; White House 2006). They called for a flexible federal response and a larger federal role in planning for catastrophes.

Organizational changes in the DHS and FEMA began soon after Katrina as these agencies faced immense media and political pressure to correct problems before the start of the 2006 hurricane season. FEMA developed a new National Response Framework focused on all hazards as the successor to the National Response Plan (FEMA 2008). It considered catastrophic incidents, all levels of government, and all sectors of communities with the intention of unifying and simplifying command and clarifying roles and responsibilities.

Evaluations of the effectiveness of the federal government's major recovery funding programs in the 2005 hurricanes—the FEMA Public Assistance and HUD CDBG-DR programs—found that neither was

well suited to large-scale disasters, and that they did not work well together, which delayed recovery (GAO 2008b, 2009a). The program approval processes were described as slow, complex, inflexible, and bureaucratic.

In October 2006, Congress passed the Post-Katrina Emergency Management Reform Act (PKEMRA), which confirmed FEMA's place within DHS but also gave it increased authority and autonomy (GAO 2008a). Responsibility for comprehensive emergency management and preparedness for both natural and man-made disasters was returned to FEMA. The PKEMRA also directed the FEMA administrator to lead a coordinated federal agency effort to develop both a national disaster housing strategy and a national disaster recovery strategy.

In January 2009, FEMA released the finalized National Disaster Housing Strategy (FEMA 2009), which aimed to clarify roles and responsibilities, establish key principles, and set a new course for sheltering, interim housing, and permanent housing. It designated HUD as the lead agency in providing permanent housing.

In 2011, FEMA released the National Disaster Recovery Framework (FEMA 2011)—the first statement of national recovery policy—which specifically identified an approach for multilevel government coordination and local empowerment and partnership in planning and managing recovery. It defined the position of federal disaster recovery coordinator (FDRC), appointed by FEMA, who reports to the FCO in a presidentially declared disaster, and it also called for the establishment of state disaster recovery coordinators, local disaster recovery managers, and local recovery organizations to provide a central point of contact for organizing, coordinating, and advancing disaster recovery operations. The framework also defined six recovery support functions (RSFs), each led by a federal supporting agency with the appropriate technical expertise. One of these RSFs, Community Planning and Capacity Building, replaces and expands the FEMA long-term community recovery planning functions of ESF-14 with the goal of improving state and local capacity by coordinating appropriate federal programs and leveraging the many partners that can support local recovery management.

THE 2012 HURRICANE SANDY

Hurricane Sandy provided the first substantial opportunity to apply some of the post-Katrina lessons, notably through the first full-scale, multistate implementation of the National Disaster Recovery Framework. It is still far too early to assess long-term recovery outcomes after Sandy, but it is useful to look at some of the governance and funding decisions that were made in the first few years of recovery. Although the effects of Hurricane Sandy were felt across a great part of the country, this study focuses on recovery responses at the federal level, in New York and New Jersey, the two most heavily affected states, and in New York City.

Sandy made landfall in southern New Jersey on the evening of October 29, 2012, and wreaked havoc across much of the northeastern United States through heavy rain, strong winds, and record storm surges. In all, the storm resulted in 159 deaths; cut power to 8 million customers; closed roadways, transit and rail lines, airports, and ports for extended periods; displaced 26,000 people in 16 states into temporary shelter; damaged over 650,000 homes; and caused long-term housing displacement of an estimated 200,000 people (Hurricane Sandy Rebuilding Task Force 2013; Lochhead 2014; Nimmich 2013). Total damage estimates exceeded $70 billion, with private insurance covering an estimated $35 billion in losses (Freedman 2013).

In New Jersey, Hurricane Sandy destroyed more than 346,000 homes and businesses, eroded hundreds of miles of shoreline and beaches, and generated statewide losses in excess of $35 billion (Christie 2012). In the state of New York, Sandy caused more than 60 deaths and $30 billion in damages (Cuomo 2013c). In New York City, Sandy's storm surge and floodwaters inundated low-lying neighborhoods, roads, and transit systems and knocked out power in every borough; fires also ensued in parts of Long Island. Forty-four residents died, 60,000 housing units were damaged, and thousands of residents and businesses were displaced, many for extended periods (PlaNYC 2013). The city estimated total damage at $19 billion and housing-related damage at $3.2 billion (Gair 2013; PlaNYC 2013).

Hurricane Sandy caused major damage to homes and infrastructure on Staten Island, as seen in January, three months after the storm. Photo by Laurie Johnson (2013).

ORGANIZING FOR RECOVERY

Thirteen states and four tribal organizations received major disaster declarations, opening the doors for FEMA Individual Assistance, Public Assistance, and HMGP funds and for a large-scale, shared governance approach to recovery.

The Federal Government

President Obama was explicit about FEMA's authority as the lead agency for both the National Response Framework and the National Disaster Recovery Framework. In New York, New Jersey, and Connecticut, FEMA activated all six RSFs outlined in the recovery framework and established over 70 disaster recovery centers to support residents and communities in accessing resources for recovery (Nimmich 2013). FRDCs were appointed

for the hardest-hit states and worked with federal emergency support function leaders for the disaster to share information about impacts and provide assistance (Fugate 2013).[18] FEMA also convened the Hurricane Sandy Catastrophic Disaster Housing Task Force to support the state-led task forces to plan both temporary and long-term housing needs (Nimmich 2013).

On November 15, 2012, President Obama announced that he had asked HUD secretary Shaun Donovan, the former commissioner of the New York City Department of Housing Preservation and Development, to work closely with governors, mayors, and local officials of New Jersey and New York and "coordinate the federal support as states design their redevelopment plans, identify priorities, and over time begin implementation of their plans" (White House 2012b). On December 7, 2012, President Obama issued an executive order forming the Hurricane Sandy Rebuilding Task Force and formalizing Donavan's post-Sandy position as its chair, stating, "A disaster of Hurricane Sandy's magnitude merits a comprehensive and collaborative approach to the long-term rebuilding plans for this critical region and its infrastructure" (White House 2012a). The task force consisted of representatives of all relevant federal agencies, with an advisory group of elected leaders from the most affected areas (Hurricane Sandy Rebuilding Task Force 2013). The executive order also reaffirmed FEMA's overall leadership of the recovery efforts and specified that Secretary Donovan and the task force would work closely with FEMA and coordinate rebuilding efforts with the National Disaster Recovery Framework.

The task force was charged with providing the coordination that was necessary to "address economic conditions and the region's aged infrastructure . . . and identify the requirements and resources necessary to bring these systems to a more resilient condition given both current and future risks" (White House 2012a). More specifically, within 180 days of its first convening of members, the task force was to prepare a strategy that included a summary of task force activities; a long-term rebuilding plan that included input from key governmental stakeholders and was informed by an assessment of current and future risks; specific outcomes,

goals, and actions, as well as any proposed legislative, regulatory, or other measures; and a plan for monitoring progress.

Much to the frustration of state and local leaders, particularly in New Jersey and New York, Congress did not act on recovery funding before it adjourned for the holidays in December 2012. The Disaster Relief Appropriations Act 2013 was passed by Congress and signed into law on January 29, 2013, and included two parts (Brown, McCarthy, and Liu 2013). The first, Division A, provided a $50.5 billion package of disaster assistance largely focused on response and recovery activities and included $16 billion in HUD CDBG-DR funds; $13 billion to the U.S. DOT for repairs to highways, railways, and public transport; $11.5 billion to fund programs authorized under the Stafford Act; $5.4 billion to the U.S. Army Corps of Engineers to repair, restore, and rehabilitate coastal protections; $545 million to the SBA; and $3.3 billion distributed across many other agencies (Painter and Brown 2013). The second part, Division B—referred to as the Sandy Recovery Improvement Act—contained a series of amendments to the Stafford Act with the stated goal of improving the efficiency and quality of disaster assistance provided by FEMA (Brown, McCarthy, and Liu 2013).

Additionally, Congress increased the NFIP's borrowing authority by $9.7 billion (from $20.725 billion to $30.425 billion) (Brown, McCarthy, and Liu 2013). As of November 30, 2014, the NFIP had paid out over $7.8 billion on 128,615 claims related to Hurricane Sandy (FEMA 2015a). A great deal of flood-related damage from Sandy, however, was uninsured and occurred outside the FEMA-mapped flood zones, in part because the maps had not been updated in New Jersey and New York in over 25 years (Dixon et al. 2013; Hurricane Sandy Rebuilding Task Force 2013).

During the spring of 2013, federal agencies established spending guidelines for federal disaster recovery funding. HUD determined that five states and one city would be allowed to apply directly to HUD for the $16 billion in CDBG-DR funds: the State of New York ($3.811 billion); the State of New Jersey ($3.293 billion); New York City ($3.22 billion); the State of Connecticut ($137.82 million); the State of Maryland ($28.64 million); and the State of Rhode Island ($19.24 million) (HUD 2014). Secretary Donovan

also established a project management office for the task force (the Sandy PMO), housed within HUD and jointly staffed by FEMA and HUD, to monitor the federal supplemental funding and serve as a central source of information on the funding activities being undertaken by federal agencies.

In August 2013, the Hurricane Sandy Rebuilding Task Force published 69 policy recommendations designed to align funding with local rebuilding priorities, eliminate barriers to recovery while ensuring effectiveness and accountability, coordinate across levels of government, facilitate a region-wide approach to rebuilding, and promote resilient rebuilding so that the region will be better able to withstand the impacts of existing risks and future climate change (Hurricane Sandy Rebuilding Task Force 2013). The recommendations were organized into seven theme areas and included developing a sea-level rise risk assessment tool and incorporating future flood risk into rebuilding efforts; creating a design competition to develop innovative, resilient solutions to address the region's most significant vulnerabilities; encouraging hazard mitigation in rebuilding; improving NFIP policyholder awareness and acting on well-documented changes in the NFIP;[19] and implementing and supporting regional rebuilding initiatives that would promote multijurisdictional approaches to problem solving.

The Hurricane Sandy Rebuilding Task Force disbanded on September 30, 2013. However, the Sandy PMO continued tracking the supplemental funding and implemented a process to track implementation of the 69 recommendations of the Hurricane Sandy Rebuilding Strategy. In October 2014, the Sandy PMO published an implementation update noting that 50 of the 69 recommendations had been completed; 7 others were to be completed by the end of 2014, and the remaining 12 were to be completed in 2015 or later (Hurricane Sandy Rebuilding Task Force 2014). The Sandy PMO and its remaining responsibilities were transferred from HUD to FEMA's Office of Federal Disaster Coordination in late 2014. FEMA maintains recovery field offices in New York and New Jersey.

The State of New Jersey

On November 28, 2012, Governor Chris Christie established the Governor's Office of Recovery and Rebuilding and named his former executive assistant attorney general, Marc Ferzan, to be the executive director (Christie 2012). The office was charged with developing recovery priorities and objectives to address the storm's impact on New Jersey communities and businesses and to work with federal, state, and local agencies to fund and implement recovery programs.

New Jersey developed an action plan of 50 recovery and rebuilding programs and initiatives for an initial allocation of $1.83 billion in CDBG-DR funds, which HUD approved in late April 2013 (Christie 2013). Of this, $1.159 billion was targeted specifically for housing, and 80 percent of the CDBG-DR funds were required to be spent in the state's nine hardest-hit counties. New Jersey's action plan for the second round of CDBG-DR funds, totaling $1.46 billion, was approved in June 2014; half of the allotted amount was designated for homeowner, renter, and small-business assistance (Christie 2014). The state's action plan for the third and final round of $501.9 million in CDBG-DR funds was approved in April 2015; all the funds were to supplement the ongoing homeowner and rental housing programs (New Jersey Department of Community Affairs 2015). The main program areas of the state's CDBG-DR funding were housing recovery, economic development, community planning, and infrastructure.

New Jersey's Department of Community Affairs (DCA) has been the lead agency for the state's housing recovery programs.[20] The DCA has worked with the state's Department of Environmental Protection (DEP) on the elevation component of the housing repair programs. The state's residential buyout program is a joint effort of the DEP, the state's Office of Emergency Management (OEM), and FEMA. The DEP has administered all home purchases, and the OEM has handled the financing through FEMA. The DEP has also led the state's demolition program and coordinated the disaster cleanup on behalf of the state, as well as many of the state's planning and infrastructure programs. The New Jersey Economic Development Authority has led the state's economic development programs and the administration of the CDBG-DR funds allocated to support the

recovery of affected businesses. Contractors have been hired as needed to supplement staff and, in some cases, to handle the day-to-day implementation of key recovery programs.

The New Jersey OEM has been the lead agency to coordinate with FEMA and administer Public Assistance and HMGP funds. The OEM established the Disaster Recovery Bureau to provide technical assistance to county and local governments, as well as other eligible private nonprofits, in applying for FEMA Public Assistance grants and managing them.

The state's recovery program has been heavily criticized for its slowness in distributing federal funds; its lack of transparency; its use of funds for affordable-housing projects in nonimpacted areas; overreliance on outside contractors and poor contractor performance in executing the state's housing repair program; and limited consideration of future risks, including climate change (Friedman and O'Neill 2014; Tanfani 2014). Governor Christie has criticized the federal bureaucracy for delays. In late 2016, the

A home in Highland, New Jersey, damaged by Hurricane Sandy, bears the message of climate change, which will increase the vulnerability of communities along the entire U.S. coastline. Photo by Laurie Johnson (2013).

state reported that it had disbursed over $2.1 billion in funding, including nearly all the $1.1 billion for the homeowner repair program (New Jersey Department of Community Affairs 2016).

The State of New York

In November 2012, New York governor Mario Cuomo established four commissions to help distill key lessons from Sandy (Cuomo 2013c).[21] The commissions' reports, issued in January 2013, helped shape, in part, the state's recovery policy and programs. They included updating the state building code to promote smarter, resilient building performance, as well as increased survivability; providing financial assistance to property owners in vulnerable areas to mitigate future threats to their damaged properties or buying these properties as part of a voluntary buyout and relocation program; ensuring that healthcare facilities were resilient; and hardening the state's infrastructure to better withstand future major storms.

HUD approved New York's action plan for an initial allocation of $1.7 billion in CDBG-DR funds in late April 2013 (Cuomo 2013a). At that time, New York governor Cuomo unveiled the Community Reconstruction Zone Program (now called the NY Rising Community Reconstruction Program) to provide additional rebuilding and revitalization assistance to communities severely affected by Hurricane Sandy, as well as the 2011 Hurricane Irene and Tropical Storm Lee; communities affected by the 2013 flooding were added later. In June 2013, Governor Cuomo established the Governor's Office of Storm Recovery (GOSR) to centralize the state's storm recovery and rebuilding efforts, and he appointed Jamie Rubin, senior adviser to HUD secretary Shaun Donovan, as the director of the NY Rising Community Reconstruction Program (Cuomo 2013b). The GOSR manages approximately $4.4 billion in CDBG-DR funds paired with additional federal funding that has been awarded to other state agencies (GOSR 2016). There are four main program areas: housing recovery, economic development, community planning and local recovery and resiliency projects, and infrastructure and the environment.

Since Hurricane Sandy, the New York State Division of Homeland Security and Emergency Services has worked with FEMA to manage the

distribution of Individual Assistance, Public Assistance, and Hazard Mitigation funds, all of which are critical to recovery. The state has received over $550 million in Public Assistance funding to rebuild infrastructure and reimburse local governments for emergency measures (GOSR 2016).

New York City

In addition to undertaking relief and restoration activities, Mayor Bloomberg charted a two-pronged approach to the city's recovery policy that largely continued into the new administration of Mayor William de Blasio in 2014. Priorities have been housing and incorporating long-term resilience into the recovery process. New York City was the only Sandy-affected city that could apply directly to HUD for CDBG-DR funds.[22] New York City anticipates receiving $13 billion of federal funding for Hurricane Sandy (NYC Recovery 2016). The city received approval for its action plan to spend $4.2 billion in CDBG-DR funds, which have come through three allocations, and the city also anticipates receiving $8.4 billion in reimbursements for emergency operations and repairs to public infrastructure and facilities from FEMA's Public Assistance program.

Just days after the storm, Mayor Bloomberg established the Housing Recovery Office and appointed the city's former deputy commissioner for the New York City Office of Emergency Management and a former FEMA recovery official, Brad Gair, as director of operations.[23] Gair was charged with developing a comprehensive inventory of transitional and temporary housing options, overseeing the transition of displaced New Yorkers to temporary housing, and marshaling resources and coordinating efforts to repair and rebuild long-term housing for those most in need. At the same time, the mayor appointed four high-level managers in his administration to serve as community recovery directors and the primary points of contact for residents, community groups, and elected officials in the hardest-hit communities.

The New York Housing Recovery Office partnered with philanthropic organizations to provide a mold remediation program and worked with FEMA to implement a pilot program that FEMA called STEP (Sheltering and Temporary Essential Power) (New York City called it Rapid Repairs),

which restored heat, hot water, and electricity to nearly 20,000 residential units in the first 120 days after the storm (Gair 2013). New York City directed $2.5 billion in CDBG-DR funding to housing recovery and over $1.4 billion in CDBG-DR funds to improve infrastructure systems and invest in resiliency measures across the city (NYC Recovery 2016). These funds are coordinated by the new Office of Recovery and Resiliency established by Mayor de Blasio.

NOTABLE RECOVERY FEATURES

Large-Scale Housing Repair Programs

New York City and the states of New York and New Jersey designed and implemented housing repair programs with their CDBG-DR funds. New Jersey's housing recovery program has operated under the name "ReNew Jersey Stronger." The Rehabilitation, Reconstruction, Elevation, and Mitigation program provided eligible homeowners up to $150,000 for recovery (New Jersey Governor's Office of Recovery and Rebuilding 2014). The Homeowner Resettlement Program has provided grants of up to $10,000 to encourage homeowners to remain in the nine most affected counties. The New Jersey Blue Acres Buyout program has combined CDBG-DR funds with FEMA HMGP funds to purchase flood-prone houses from willing sellers. Other programs include a large multifamily restoration program, a pilot program to improve blighted neighborhoods, a small rental repair program, affordable-housing rental offset incentives, a homebuyer assistance program, a special-needs housing fund, and low-interest loans for the predevelopment costs of affordable housing.

The State of New York has allocated over $2 billion in CDBG-DR funds for housing recovery (GOSR 2016). The recovery programs are for single-family homeowner repairs, rehabilitation, mitigation, and elevation ($1.056 billion); home buyout and acquisition ($621.2 million); assistance to owners of multifamily rental properties, cooperatives, condominiums, and owners' associations ($232.5 million); and supplemental housing assistance through an interim mortgage and housing assistance program ($49 million). As of October 2016, over $1 billion had been awarded to repair single-family

In October 2013, housing repairs involving floor elevations to mitigate future flood risks were under way in the Borough of Sea Bright, New Jersey. Photo by Laurie Johnson (2013).

homes; 11,000 households had been assisted in rebuilding and repairs; 1,200 home elevations had begun; and 610 properties had been purchased and converted to permanent open space (GOSR 2016).

New York City has used $2.5 billion in CDBG-DR funds for its Build It Back housing recovery program, which serves single-family homeowners, rental building owners, and very low income renters; the remainder of the housing funds have been targeted at improvements to public housing infrastructure. The Build It Back Single Family Program has been designed to assist owners of properties with one to four units who were initially offered three options, all to be completed by city contractors: minor repairs, major repairs with home elevation to comply with new flood elevation standards, or a complete rebuild. The city launched the program in June 2013 and received nearly 20,000 applications by the cutoff date in December 2013, but only 110 applicants had reached an agreement with the city by that time (Durkin 2014). The de Blasio administration made several adjustments to help expedite and improve the program, including two

additional options: reimbursement for repair expenses made by owners in absence of a city settlement, and voluntary acquisition in conjunction with the State of New York's program (Goldstein, Peterson, and Zarrilli 2014). As of December 2016, reimbursements had been made to repair 5,846 single-family homes and 448 multifamily units (NYC Recovery 2016).

Innovative Federal, State, and Local Recovery Planning

Three innovative approaches to post-disaster recovery planning—Rebuild by Design, the NY Rising Community Reconstruction Program, and PlaNYC—were launched after Hurricane Sandy. Each merits evaluation and continued observation as the implementation unfolds.

Rebuild by Design

In June 2013, the Hurricane Sandy Rebuilding Task Force launched Rebuild by Design, a multistage regional design competition with the goals of promoting innovation by developing regionally scalable but locally contextual solutions that increase resilience in the region, and implementing selected proposals with $1 billion in CDBG-DR funding set aside to serve as seed capital for the winning projects. The program enlisted the support of private foundations—particularly the Rockefeller Foundation, which provided $3 million—to support the management logistics of the competition and fund the design teams and community-participation efforts (Lochhead 2014; C. Martin 2015).[24] The competition process was relatively short—10 months—and design parameters and constraints were intentionally unspecific, all in an effort to stimulate energy and innovation.

Out of nearly 150 submissions, the task force selected 10 multidisciplinary design teams, each with diverse expertise in landscape architecture and planning, infrastructure and environmental design, engineering, hydrology, and ecology (Lochhead 2014). The process required that the selected teams work collectively in a research phase to interrogate the issues regionally before settling on a specific project and location, engaging local stakeholders in the design process, and working through a rigorous implementation planning process. In June 2014, six projects were selected,

and the winners set about the long process of turning the designs into actionable projects (C. Martin 2015).

NY Rising Community Reconstruction Program

New York State's NY Rising Community Reconstruction program enables communities to identify resilient and innovative reconstruction projects and other needed actions by developing community-driven recovery plans that consider current damage, future threats, and economic opportunities. FEMA's Community Planning and Capacity Building team collaborated with the state on the program. Communities that successfully completed a recovery plan were eligible for between $3 million and $25 million from the $900 million in CDBG-DR and FEMA HMGP funding available for the program to implement their plans (Cuomo 2013b).

Each NY Rising community was asked to establish a planning committee composed of local residents and business leaders, as well as municipal representatives and elected officials with nonvoting status, to lead plan development. In addition, the state provided each community with a planning team to help prepare the plan. The state's guidelines recommended that the planning content include an overview of the community and its goals, critical issues, and disaster damage; an assessment of community assets, risks, needs, and opportunities; a series of reconstruction strategies organized around the six recovery support functions in the National Disaster Recovery Framework; and an implementation schedule (New York State, n.d.).

Consultants were hired through a state process administered by the state's Office of Community Renewal and the Housing Trust Fund Corporation. Planning experts from the New York Department of State and Department of Transportation were also assigned to each community to provide technical assistance and help oversee the planning consultants. The state also prepared tools and guidelines with help, in some cases, from federal partners to assist communities and their consultants to complete the process using consistent methodologies, including sample assessments of housing and economic needs, risk-assessment mapping methodology,

coastal and riverine risk-assessment tools for evaluating community assets, and risk-assessment maps (New York State, n.d.).

In April 2014, the plans developed by 50 local planning committees and containing more than 700 proposed resiliency projects were unveiled at the 2014 NY Rising Community Reconstruction Conference (Cuomo 2014). Since that time, the state has been working with communities to match CDBG-DR and HMGP funds to projects and to help identify other community development resources for implementation. As of late 2016, 66 community reconstruction plans have been completed, and more than $460 million of the state's recovery funds have been dedicated to more than 250 active local recovery and resilience projects through the NY Rising Community Reconstruction Program (GOSR 2016).

PlaNYC

In December 2012, Mayor Bloomberg convened the Special Initiative for Rebuilding and Resiliency (SIRR) and charged it with "analyzing the impacts of the storm on the city's buildings, infrastructure, and people; assessing the risks the city faces from climate change in the medium term (2020s) and long term (2050s); and outlining ambitious, comprehensive, but achievable strategies for increasing resiliency citywide" (PlaNYC 2013, 2). The mayor also asked SIRR to develop proposals for rebuilding city neighborhoods hardest hit by Sandy. The result of this effort—and the latest incarnation of PlaNYC—was a comprehensive plan to rebuild after Sandy and increase resiliency citywide, titled *A Stronger, More Resilient New York* and released in June 2013 (PlaNYC 2013). The plan includes 257 initiatives to strengthen the coast, upgrade the city's building stock, protect the city's critical infrastructure and services, and make New York's neighborhoods safer and more resilient. The Office of Recovery and Resiliency shares responsibility with the Mayor's Office of Long-Term Planning and Sustainability for the management and implementation of PlaNYC. The de Blasio administration has committed to develop plan updates every four years and provide annual progress reports.

LESSONS FROM THE 2001, 2005, AND 2012 DISASTERS

The discussions in this chapter illustrate only part of the challenging and complex recovery management experiences of government organizations at all levels in dealing with three of the costliest urban disasters in U.S. history. During this period, the federal government has continually struggled to find a model for recovery that is both responsive to victims' needs and mindful of the nation's purse. The implicit goal after each of these three disasters was to speed the flow of money to allow for timely reconstruction while still providing accountability. In each case, there were tensions over bureaucratic delays, but from the federal point of view, these simply reflected the need for accountability.

Among these three cases and all the other cases in this book, the World Trade Center disaster stands out for the swift federal commitment of funds and reduction of bureaucratic red tape. Several unique aspects of this case were likely responsible for this: (1) Congress and the nation were astonished by the devastation and generous in their support; (2) New York City is the nation's leading financial center; (3) New York City has sophisticated and experienced local and state governments with more capability than most; and (4) the governor and mayors were all effective leaders and belonged to the same political party as the White House. But this unique combination of factors created problematic precedents. Louisiana, for example, had great need and expectations after Katrina, but none of these four factors applied in its case. That some of them applied to Mississippi created further tension. Louisiana faced numerous bureaucratic obstacles after Katrina because extremely large sums of money were flowing through a variety of programs, but Louisiana and New Orleans lacked capacity to manage a process on the scale of Hurricane Katrina; in addition, the federal government had a low level of trust in their capabilities. The contrast with World Trade Center disaster made this all the more frustrating for Louisiana.

Hurricane Sandy presented an opportunity to test refinements in the model of federal recovery without the mistrust that operated after Katrina. Sandy was also the first full-scale multistate implementation of the National Disaster Recovery Framework. The Hurricane Sandy Rebuilding

Task Force, established by and reporting to the president, was an attempt to enhance coordination among a number of large federal programs and the effectiveness of funding to some of the nation's most populous states and cities. Detailed evaluations of how these two federal coordination efforts worked individually and together have not yet been produced. The White House acknowledged both efforts, but the task force had a direct line to the White House, whereas the National Disaster Recovery Framework's leadership was several levels removed. With both, however, there have been greater expectations of accountability and transparency than in prior disasters.

Despite this added effort to coordinate, strong evidence has emerged since Sandy that the federal recovery framework is still overly complicated and potentially less effective because of the many disconnected pots of money. In particular, FEMA HMGP funding needs to be better integrated in both timing and purpose with the HUD CDBG-DR and FEMA Public Assistance funding. The complexity and the disconnected timing and authorities of the different federal funding programs are, in large part, the reasons that each of these cases is so complicated and difficult to describe. In each, the level of authority for spending funds from different federal recovery programs resided in a slightly different place, for different reasons, and the programs evolved from one case to the next. Is it possible for the federal government to provide funds and guidance but allow state and local governments greater freedom in implementation? Each case illustrates a struggle to negotiate this.

These cases demonstrate a steadily growing federal role in post-disaster recovery policy and priority setting, as well as funding for recovery from large disasters. The federal government has been schizophrenic about this. Although it sincerely repeats the mantra "All disasters are local," and the National Disaster Recovery Framework stresses that local communities are the leaders of their recovery, when large disasters strike, the Congress and White House feel compelled to provide considerable aid, and, to be responsible to the nation's citizens, they specify how that money should be spent. The federal government's desires to provide post-disaster aid may be, in part, a reflection of the diminishing influence and resources that it has, in general, to invest in cities and regions. Given little discretionary funding

and the self-imposed constraints on earmarking (Katz 2014), post-disaster recovery may be one of the few remaining ways in which elected officials can provide direct and tangible assistance to their home states and towns, especially through the CDBG-DR program.

There has also been a progressive centralization of recovery decision making and authority at the state level, especially in setting of recovery priorities and program design. HUD's decisions on whether to fund only states or also selected cities and counties, as well as the action plan requirements of the CDBG-DR program, are some key drivers of this centralization. Although the CDBG program does require public input on the action plans, participatory processes at the state level are inherently less localized. The time pressure to complete these action plans and receive the funding also heavily influences priorities and program choices.

State centralization also provides some very positive examples of recovery governance, organizational design, and management. Louisiana, Mississippi, New York, and New Jersey constitute good examples of post-disaster recovery planning, policy and priority setting, transparency of communication and information provision, and attention to local capabilities and capacity building. However, establishment of these new organizations and some of the resulting large, state-administered programs took time, and each has faced criticism from local governments, homeowners, and businesses for the delays and the bureaucracy involved in applying for and obtaining funds. State-municipal tensions also played out in various ways in each of these cases. If a city is big and has a large share of the damage, does it not deserve to have its own authority? But capacity is a very real and critical issue. New York City has capacity; New Orleans did not. There are similar tensions and challenges in state-state and city-city coordination. After Sandy, New York and New Jersey adopted very different policy approaches and program designs. Louisiana and Mississippi did not need to coordinate as much. But this could be a significant issue in future disasters.

The Hurricane Sandy Rebuilding Task Force strategy and the National Disaster Recovery Framework are laudable for their focus on local capacity building, collaboration and partnerships, resilience, and regional approaches. The task force strategy also stresses the importance of viewing the post-Sandy reconstruction process as part of a broader context that re-

quires action on climate-change adaptation and long-term risk reduction. As Rubin notes, "Full and effective implementation of the [Hurricane Sandy Rebuilding Task Force Strategy] recommendations will be expensive, since it requires federal outlays for buyouts and environmental compliance measures. . . . The ability of local governments to incorporate and use this information in their land use decisions is still in question" (Rubin 2013). Also, since the task force was created by a presidential executive order, the report is nonbinding and unenforceable at the state and local level. There are no mechanisms to enact penalties if states and localities violate any of the findings (Rubin 2013). Perhaps the task force process will be a model for future catastrophes. The federal government needs more effective ways to support long-term processes and then provide the appropriate resources.

In all the cases, localized planning processes sought betterment (including hazard mitigation), but there were problems connecting these efforts to federal program timelines and conditions. New York State's NY Rising program and New York City's PlaNYC both have taken longer-term views of hazard mitigation in their post-disaster planning and program design, and each deserves further evaluation over time.

Finally, these cases all show that recovery after a large-scale disaster takes a very long time. It is never easy, and it is never fast enough for affected residents. There is a need to be more realistic in setting expectations at the outset and to ensure governance sustainability for recovery over the long term.

NOTES

1. Johnson and Olshansky began their study of recovery efforts within the United States following the 1989 and 1994 earthquakes in California. Johnson's recovery career began with Spangle Associates, and she subsequently served as consultant to HUD following the 1997 flood in Grand Forks, ND. Olshansky and Johnson's study of recovery following Hurricane Katrina was supported by the National Science Foundation. Johnson was a recovery planning consultant to the Greater New Orleans Foundation on the Unified New Orleans Plan, the New Orleans Redevelopment Authority following Hurricane Katrina and the Borough of Sea Bright, New Jersey, following Hurricane Sandy. Her United States–wide research work has also been supported by the Federal Emergency Management Agency.

Olshansky's research in New Orleans has been supported by the Mid-America Earthquake Center, Lincoln Institute of Land Policy, and Public Entity Risk Institute. Both authors have benefited from countless opportunities provided over the years by the American Planning Association, including conferences, workshops, and publications, most of which were instigated by James Schwab.

2. Municipalities are legally established through a state-granted charter of incorporation; thus, states have full authority over local governments unless there are constitutionally imposed limitations on the state's authority.
3. Many states require cities and counties to adopt a general plan, also referred to as a comprehensive plan or master plan. State regulations typically specify the plan contents.
4. The governors of New York and New Jersey jointly control the Port Authority and appoint equal numbers of members of the board of directors. Traditionally, the governor of New York appoints the executive director, and the governor of New Jersey appoints the chair of the Port Authority. The Port Authority maintained its offices in the Twin Towers, and 84 employees, including Executive Director Neil Levin, were killed in the attacks.
5. The CDBG-DR funding included $329 million for the planning, design, and construction of the September 11 memorial and museum; $292 million to purchase, deconstruct, and prepare the site of the former Deutsche Bank building; and $160 million to construct a performing-arts center on the WTC site (NYCIBO 2011).
6. After Hurricane Betsy in 1965, Congress authorized the construction of the rings of levees and flood walls known as the Southeast Louisiana Hurricane Protection System. Forty years later, in 2005, this system was still incomplete. It was also later proved to be plagued with poor construction and design issues (IPET 2009).
7. Even the NFIP flood insurance rate maps did not fully account for the potential catastrophic failure of New Orleans's levee system. It was therefore possible to build NFIP-compliant homes (eligible for flood insurance) in low-lying areas of the city with at-grade, slab foundations, which significantly increased their vulnerability.
8. One model called for the creation of an office of Katrina recovery administrator in the Executive Office of the President (Hogue 2005). Another called for the establishment of a federal-level recovery corporation, to be funded by the sale of federal bonds over 10 years, to lead Louisiana's rebuilding process (Baker 2005). The strong federal leadership exhibited after the 1927 Mississippi floods and the 1964 Alaska earthquake were also cited as possible prior models (GAO 2009b; Kosar 2005).
9. Andrew Kopplin was chief of staff to two consecutive Louisiana governors before serving as the founding executive director of the LRA from October 2006 to January 2008. In May 2010, he joined the administration of New Orleans mayor Mitch Landrieu to serve as first deputy mayor and chief administrative officer.
10. At that time, the LRA Board of Directors was reduced from 33 to 17 members: 13 members appointed by the governor and confirmed by the Louisiana Senate and including one member from each of the state's four congressional districts as

well as four ex officio members—the speaker and speaker pro tempore of the Louisiana House of Representatives and the president and president pro tempore of the Louisiana Senate.

11. The city's claims for FEMA Public Assistance were mainly for damage to the more than 400 buildings that it operated and the 1,600 miles (2,575 km) of streets that it maintained (UNOP 2007). All utilities were owned and operated by separate entities, some of which were public, such as the New Orleans Sewerage and Water Board, while others were private.
12. The City of New Orleans's Office of Inspector General later investigated the contract and found that its terms did not provide appropriate controls or incentives to contain costs, and that the city's contract oversight was inadequate to protect against excessive fees and inappropriate contractor charges (OIG 2010). It also found that the city relied on the state revolving fund to pay for project expenses, including contractor fees, which would not be reimbursed by FEMA, and thereby put the fund and the overall recovery program at risk.
13. Mitch Landrieu was Louisiana's lieutenant governor during and after Hurricane Katrina and ran unsuccessfully for mayor against Ray Nagin in the 2006 elections. He is the son of former New Orleans mayor and secretary of HUD Moon Landrieu and the brother of Mary Landrieu, former U.S. senator from Louisiana.
14. New Orleans's blight-reduction strategy received awards from the Harvard University Kennedy School of Government Ash Center for Democratic Governance and Innovation as a "Bright Idea in Government" in 2012 and the HUD secretary's 2012 award for its public-philanthropic partnership with the Greater New Orleans Foundation, NORA, and the Center for Community Progress.
15. The Louisiana Speaks program also developed a pattern book and tool kit for individual building reconstruction and oversaw a series of neighborhood planning charrettes in heavily damaged communities.
16. The Louisiana Speaks Regional Plan was followed by a strategic implementation plan document in July 2007 that identified specific follow-up actions, chiefly the establishment of a state planning office and statewide systems for local comprehensive planning, financing of roadways and transit projects, and technology transfer and geographic information systems. After this, the Louisiana state legislature created a task force to study and make recommendations for the creation of a comprehensive office of state planning; no further action was taken after the state enacted a hiring freeze in 2008.
17. The Louisiana Land Trust is governed by a seven-member board of directors, with at least three members from parishes most affected by Hurricane Katrina and at least three members from parishes most affected by Hurricane Rita (LLT 2015).
18. The FDRC for New Jersey hired 10 local community recovery assistance specialists to provide local redevelopment and planning technical assistance, and, under the Community Planning and Capacity Building RSF, FEMA worked with local philanthropic organizations to identify funding sources for long-term recovery planning and capacity building and to fund local disaster recovery managers in at least three New Jersey communities (Fugate 2013).

19. FEMA issued updated advisory base flood elevation maps in mid-2013, and the National Oceanic and Atmospheric Administration, in cooperation with FEMA and the U.S. Army Corps of Engineers, released potential sea-level-rise maps and a risk-assessment tool for communities to use in planning for rebuilding after Sandy (Hurricane Sandy Rebuilding Task Force 2014).
20. In January 2013, Louisiana sent its chief of staff of the Office of Community Development Disaster Recovery Unit to work in New Jersey's Department of Community Affairs to help establish recovery priorities and procedures. A delegation of Louisiana staff later visited all the states eligible for CDBG-DR funds and New York City to discuss lessons learned in administering Louisiana's CDBG-DR funds.
21. The NYS Ready Commission was tasked with preparing networks, systems, and structures to withstand a major weather event. The NYS Respond Commission was tasked with ensuring the ability and capacity to respond effectively to a natural disaster. The NYS2100 Commission reviewed vulnerabilities in the state's infrastructure systems and developed specific recommendations to increase their resilience. The Moreland Commission reviewed the response, preparation, and management of New York's power utility companies with respect to Sandy and other recent storms affecting the state, as well as the state's energy agency and functions.
22. Other cities that were CDBG grantees before Sandy, such as Atlantic City, Jersey City, and Newark, New Jersey, had to apply for post-Sandy CDBG-DR funding through the state government.
23. Brad Gair served as the federal recovery officer for the World Trade Center attacks. He was also an FCO with FEMA from 1999 to 2006 and was involved with hurricanes in Texas (1999) and Florida (2004), Hurricane Katrina (2005), and the World Trade Center disaster (2001).
24. The Hurricane Sandy Rebuilding Task Force and HUD partnered with New York University's Institute for Public Knowledge, the Municipal Art Society, the Regional Plan Association, and the Van Alen Institute to manage the competition (Lochhead 2014). Winning design teams received $200,000 each for their work (C. Martin 2015).

8 Conclusions and Recommendations

Upon hearing the purpose of this book, a key leader of the Indonesian recovery efforts after the eruption of Mount Merapi and the Yogyakarta earthquake responded that there are no general lessons to learn. "All disasters are unique," and the best advice for recovery is to "apply local wisdom."

Certainly, every disaster is different, and, as the cases discussed in this book demonstrate, local knowledge and leadership are important keys to recovery success. But there is great value in learning from experiences in other places. The political, social, and economic contexts may be unique in each case, but the challenges are not, and learning from other cases can inspire comfort and creativity. Experience shows that every place struck by disaster reaches out to those who have experienced it before, and people learn from the experiences of others. After the 2008 earthquake, the Chinese organized conferences that assembled the collective wisdom of international planning and recovery experts; Louisiana invited the director of the Lower Manhattan Development Corporation to help it after Hurricane Katrina; and Indonesian officials relied on advice from UNDP and World Bank staff who had previous experience in disaster recovery in India and elsewhere. This happens after every large disaster. What are some of the things that they learn? What do these post-disaster recovery cases have in common?

One of the most visible governmental responses to disaster is the creation of a new agency or the rearrangement of existing organizations to serve as the focal point for recovery efforts. These range from all-encompassing new organizations, such as New Zealand's Canterbury Earthquake Recovery Authority and Japan's national Reconstruction Agency, to oversight groups, such as the Louisiana Recovery Authority, and recasting of existing government agencies, such as China's National Planning Group of Post-Wenchuan Earthquake Restoration and Reconstruction within the State Council.

The most common reason for these post-disaster governance transformations is a lack of capacity within the existing government to manage the new problems of recovery. Governments still need to attend to their normal daily affairs while they take on the added responsibility to coordinate the reconstruction or reinvention of affected communities, so they appoint an entity that can focus daily attention on rebuilding while also coordinating the recovery-related activities of multiple government agencies. Because these recovery agencies serve a variety of purposes and governmental set-

People gather for a local competition at Cathedral Square in Christchurch, New Zealand. The historic Canterbury Cathedral was damaged repeatedly by the Canterbury earthquake sequence, and, as of early 2017, its future remains uncertain. Photo by Laurie Johnson (2015).

tings, they differ depending on the type and scale of coordination they provide, the scope of their authority, and the level of government they serve.

THE CHALLENGES OF RECOVERY

Post-disaster recovery is a time of collective uncertainty. The most important goal of recovery efforts should be to reduce this uncertainty by finding funds, establishing procedures, providing information, and actively involving all stakeholders so they can help inform good decision making and policy design while gaining information and determining a clear path for action. Various coordinating organizations inevitably emerge during the complex periods of post-disaster recovery, and they all face common challenges: managing the flow of money and information, supporting collaboration at all levels, and striking a balance between speed and deliberation within compressed time.

Managing Money

Obtain and distribute recovery funding efficiently, effectively, and equitably.

Large infusions of money are the foundation of recovery. Quick access to public and private funds is required to rebuild and replace lost infrastructure, homes, and businesses. For example, U.S. states called on Congress to provide funds for permanent reconstruction; the Chinese government told eastern provinces to allocate a portion of their budgets to help the stricken western counties; and Indonesia asked for help from international donors after the 2004 tsunami. Most, if not all, of the power over the recovery process resides with the level of government that controls the acquisition, allocation, disbursement, and audit of public funds.

The most important functions of recovery organizations, whether they are new or rearrangements of existing entities, are to persuade donors to provide money, develop policies on how to spend the money, distribute the funds, and monitor and audit the outcomes. These organizations must establish accounting systems for timely disbursal of critical financing, ensure transparency, and minimize corruption. Money always flows to disaster-affected localities with strings attached.

Donors expect to see plans for spending the money. Ideally, a plan would be part of the application for the money, but after a disaster, donors often make the financial commitment first. International donors sometimes are willing to commit the funds, as in Aceh, as long as they can oversee a process for disbursement and require frequent reports. In this way, donors influence the evolving development of recovery policies. When the national government is the donor, as in Japan, New Zealand, and the United States, it usually requires a local plan before it provides the funds, and often it closely controls the preparation of that plan. New Zealand's CERA rewrote the Christchurch central-city plan to make it more to its liking. After the 2011 tsunami, Japan's Reconstruction Agency provided narrowly prescribed planning guidelines to the prefectures and local governments. In the United States, HUD requires detailed action plans for the proposed use of all CDBG-DR funds.

After a large disaster, affected areas ask donors to commit money as quickly as possible, even in the absence of specific plans or policies for how they intend to apply the funds. In such situations, a rapid damage assessment is crucial, even if it is approximate. The desire for speed competes with the need for accountability, and donors may be reluctant to contribute too quickly. This tension varies greatly among and within the cases in this book. In the United States after September 11, 2001, Congress appropriated funds within days, based on very rough damage estimates. Indonesia's three-week process to make an initial damage estimate for the first donors' meeting after the 2004 tsunami was equally rapid and approximate, given the affected area's remote location and limited accessibility, but it resulted in initial commitments totaling over $500 million. Conversely, the U.S. Congress was very deliberate in providing funding after Hurricane Katrina; four separate appropriations extended over two years, and the first allocation was not passed until four months after the disaster. The Japanese government provided financial assistance for recovery just six weeks after the 1995 earthquake in Kobe, but after the 2011 tsunami, it did not begin authorizing funds for permanent reconstruction until eight months after the disaster.

Local governments also need allowances for debts and lost revenues resulting from the disaster. For example, the Christchurch City Council in

New Zealand has faced a funding shortfall of NZ$1.2 billion and has had to consider selling off portions of its assets, such as the port, the airport, and utilities, to help fill the funding gap.

In the United States, under the national Stafford Act, a federal disaster declaration means that local governments may receive reimbursement for a portion of the costs they incur for disaster response and recovery. However, a disaster reduces local revenues and property tax valuations and makes it very difficult for many local governments to initially fund their portion of these costs. Sometimes, Congress and the president agree to waive the funding-match obligation of some key federal programs, but this often happens many months or even years after the disaster. After Hurricane Katrina, Congress removed the $5 million cap from the federal community disaster loan program. Local governments in Louisiana and Mississippi that suffered a projected loss of 25 percent or more in tax revenues could borrow up to 25 percent of their annual operating budget to perform their governmental functions. These loans were vital to the City of New Orleans and other local agencies after Hurricane Katrina.

Money is the starting point, but its allocation is what triggers broader recovery policies and priorities. Recovery management organizations have their greatest effects on communities through the creation and implementation of these policies.

Requirements for accountability and governance reforms as a condition of funding can lead to permanent improvements in government. New Orleans and the state of Louisiana, under pressure to reassure the nation that they would be good stewards of taxpayer dollars, instituted new policy-making and governance oversight mechanisms and reformed planning, zoning, and budgeting systems. Provision of housing funds after disasters in India and Indonesia required changing archaic and inequitable property rights systems by instituting joint titling between husband and wife.

Donors also expect to see risk reduction to reduce potential damage in future disasters. This can involve specific building and land use standards in the immediate reconstruction, as in the case of post-tsunami recovery in Japan; training programs to change construction practices, as in Maharashtra and Gujarat; or improved long-term planning and development

procedures, as facilitated by the hazard-mitigation planning process in the United States.

Finally, in the time-compressed post-disaster environment, money takes on many political and symbolic meanings. Because of the large sums being spent quickly, it is easier than in normal times to see the outcomes where money is spent, and where it is not. Thus, political parties may fight for control of the funds so that they can make political statements by how they choose to spend them. The ruling party often seeks to apply post-disaster funds to demonstrate the superiority of its philosophy or to appeal to its core constituencies. For example, it might show its commitment to residents by emphasizing housing as a priority, as in Gujarat after the 2001 earthquake. Or it might seek to benefit middle-class homeowners, as Louisiana did after Hurricane Katrina. After the Wenchuan earthquake, China viewed the world as its audience, and its political statement sought to demonstrate the ability of the Chinese system to mobilize resources, meet the disaster needs of millions of people, and create new and better cities out of the rubble in just two to three years. Indonesia was able to use the world's generous post-tsunami donations to solve what had been an endless conflict in Aceh, not only rebuilding areas damaged by tsunami and war but also creating governmental capacity. Some projects have symbolic value, such as memorials, museums, or visible public buildings.

Increasing Information Flows

Gather, integrate, and disseminate information effectively to enhance decision making and actions by all recovery actors.

Often, recovery actors must work without full awareness of what others are doing and without current information. A critical role of recovery management organizations is to increase information flows among recovery actors about current reconstruction activities and emergent opportunities. Such communication can help spread innovations among recovery actors, as well as promptly convey citizen concerns to government agen-

Approximately 200,000 housing units, such as these in Bhuj, were reconstructed after the 2001 earthquake in India. Photo by Robert Olshansky (2011).

cies. Ways to accomplish this include organizations made up of multiple agency directors, regular meetings of representatives from governmental and nongovernmental organizations (NGOs), paid neighborhood planners or liaisons, newsletters, websites, data centers, and data clearinghouses.

The BRR in Aceh viewed information management as one of its primary functions. For example, it created databases of projects and NGOs and posted them online. In India, after the Gujarat earthquake, a key function of the widely successful setu subcenters was their role as information centers to facilitate communication among the government, villages, and construction organizations. In the United States, the Hurricane Sandy Rebuilding Task Force, consisting of cabinet members, increased the flow of information among federal agencies.

Supporting Collaboration

Build sustainable capacity and capability for long-term recovery through genuine collaboration and coordination, both horizontally and vertically, among different levels of government.

Successful recovery management organizations empower networks to build capacity throughout society. In Gujarat, India, the GSDMA coordinated and supported the work of NGOs, including the Abhiyan network, which coordinated and assisted local organizations. In several of the cases discussed in this book—Kobe and the Tohoku region of Japan; Louisiana, New York, and New Jersey in the United States; Aceh and Yogyakarta in Indonesia; and Gujarat and Maharashtra in India—government or government-sponsored recovery organizations paid for planners or facilitators to help communities plan for their future and rebuild.

Within a government, horizontally organized groups can promote coordination and information sharing, allowing individual offices to adapt to new contexts while remaining responsible to their parent organization. Conversely, vertically organized, hierarchical agencies with clear organizational charts and streamlined channels of communication are usually not well suited to manage disaster recovery because the lack of connecting flow across vertical hierarchies limits collaboration. U.S. national agencies involved in recovery, for example, are more adept at administering individual programs than they are at solving complex problems that cut across governmental institutional boundaries. This has also long been a concern in Japan, where ministries typically do not coordinate with one another. The Japanese government is trying to change this in the post-tsunami recovery. For example, the national Reconstruction Agency's centralized oversight of programs usually managed separately by physical, economic, and social agencies is working to provide a more comprehensive set of recovery solutions to each locality.

New Zealand established a centralized, hierarchical structure after the February 2011 earthquake. As with Japan, it is still too early to judge the overall success of this structure, but some of the typical problems of hierarchy may be less pronounced in New Zealand because the country is

small, and there is strong community capacity to self-organize; in addition, the national government's transfer of some recovery authorities and responsibilities back to local councils at the five-year point may help alleviate some of the communication and collaboration challenges experienced in the first five years of recovery.

China presents an intriguing contrast. Although the top-down system was responsible for rapid physical reconstruction, it often overlooked social and economic recovery issues, and it was not designed to build local capacity or empower residents. But China's pairing system is one of the best examples of intentional distribution of capacity; in this case, the central government distributed responsibility to unaffected parts of the country, which, in turn, were able to share resources and work with local governments in the affected areas to rebuild jointly.

Balancing Time Constraints

Meet the immediate and pressing local needs for recovery while capitalizing on opportunities for long-term betterment.

Governments face a balancing act as they confront the tensions between speed and deliberation, and between restoration and betterment. One way to reconcile these opposing demands is to maximize information flows to increase the effectiveness of recovery processes without needing to slow down.

Recovery agencies have identified several other ways to attain both speed and improvement. Governments can hasten reconstruction by streamlining normal bureaucratic processes of decision making, such as construction permits, without compromising quality. This can be done by setting up fast-track permit offices, collaborating with other agencies in one-stop permit offices, or reducing detailed front-end review in favor of audits (with substantial penalties) later. Because approval processes often involve multiple agencies, a recovery agency can be helpful if it is empowered to help or compel line agencies to cooperate more effectively, as in the case of the authority granted to the national Reconstruction Agency in Japan. Recovery agencies that carry the authority of the executive branch

of government (often with the president or the prime minister as the chair) are best able to do this, such as the GSDMA in Gujarat, the PMU in Maharashtra, or the BRR in Aceh. In China, the State Council, which is the highest level of government in China, issued all recovery plans and policies. In the United States, the Hurricane Sandy Rebuilding Task Force was led by the White House to facilitate federal agency cooperation in speeding and improving recovery actions; in contrast, the post-Katrina Office of the Federal Coordinator for Gulf Coast Rebuilding was housed within the Department of Homeland Security and had little authority over other cabinet-level departments.

A good recovery organization is designed to perform a variety of functions effectively and simultaneously: gathering information, communicating, planning, monitoring, pursuing transparency and accountability, and facilitating financial flows, all while creating space for continuous evaluation and reflection. The BRR in Indonesia is a good example of an organization that was designed to do all these things at the same time in a challenging post-disaster and postwar environment.

Some observers have noted the paradoxical need to slow down initially in order to proceed faster later on: "slow down to speed up" (Chandrasekhar, Zhang, and Xiao 2014, 381). Kobe and Hyogo Prefecture spent the first six months after the 1995 earthquake devising plans, policies, and programs and working out financing arrangements with the national government, all of which enabled them to proceed more quickly and confidently with implementation. After the 2011 Tohoku disaster, the Japanese government spent three months devising a conceptual framework and then designated the Cabinet Office to develop strategic policies over the next few months before launching the Reconstruction Agency, all the while tempering expectations by emphasizing that the recovery process would take a decade to complete. Conversely, Murty et al. (2005) described rehabilitation packages in Gujarat that were announced so quickly that they may have slowed eventual completion.

Proceeding too quickly or ignoring stakeholder concerns runs the risk of legal challenges or, even worse, the rebuilding of new communities that are poorly designed for resident needs, inconveniently located, or unsafe. In at least two cases—the Wenchuan earthquake and the Tamil Nadu

tsunami—many of the new homes remain unoccupied for these reasons. In New Zealand, the Supreme Court ruled that the minister for Canterbury earthquake recovery and the Ad Hoc Cabinet Committee on Canterbury Earthquake Recovery overstepped post-disaster authority provided under the Canterbury Earthquake Recovery Act 2011 by not undertaking sufficient recovery planning processes for key decisions initiated early in the recovery process, such as the voluntary land acquisition program.

RECOMMENDATIONS FOR RECOVERY

"A trade-off between the time required, the quality of work and the level of public participation is inevitable in a post-disaster reconstruction process. The true challenge before political leaders and bureaucrats is the negotiation of this trade-off in a transparent manner, taking the people along" (Balachandran 2010, 202). After a large disaster, officials at all levels of government face several important questions:

- How should they begin? What should they do first?
- Do they need to develop a plan before they start facilitating reconstruction, or can they plan (deliberate) as they go?
- How should they coordinate the many actors, including government agencies at various levels?
- How can they streamline funding mechanisms while still requiring accountability?
- To what extent can they facilitate significant change from the pre-disaster state?
- What should they do if the disaster is so big that it reduces local capacity? Do higher governmental levels need to take control, or should they engage in building the capacity of lower government levels?

The following set of general recommendations provides some initial guidance to governmental organizations faced with the challenges of recovery. Many of these recommendations overlap, and collectively, they reflect a common set of broad principles: the primacy of information, stakeholder involvement, and transparency.

Recommendation 1: *Enhance existing structures and systems to promote information flow and collaboration.*

Conventional policy making and bureaucratic organizations are not designed to deal effectively with the compressed time of the post-disaster environment. New organizational transformations and approaches to planning, managing, and financing recovery are needed. New NGOs inevitably emerge to fill roles for which government bureaucracies are unsuited. The post-disaster NGO networks in India and the *machizukuri* community-based planning groups in Japan are good examples. Official recognition by the government helped them create broad-based, self-organized networks of stakeholders that exceeded anything that government alone would have been able to do. The role of governmental recovery offices is to inform, support, facilitate, and influence (manage) the many recovery actors.

The most effective type of recovery organization is one that coordinates and supports other agencies in doing what they do well in normal times. The value added by the recovery organization is not in performing a radical new function, but rather in helping existing public and private organizations perform more effectively in post-disaster time compression.

If governments propose entirely new operations for which they lack prior experience, they should consider the time and money needed to fulfill the functions. For example, large-scale post-hurricane housing repair programs undertaken in Louisiana, New York City, and New Jersey and the land buyout program in New Zealand after the 2010–2011 earthquakes were riddled with public controversy and oversight investigations.

That said, governments, cities, and regions may want to permanently retain some of the mechanisms and forums for collaboration that they create after a large disaster. If the collaborative relationships are successful, they can help address other crises in the future, thereby enhancing the long-term resilience of the region. The same can be said for new organizations and policies created to promote disaster risk reduction in reconstruction. In Gujarat, the GSDMA not only led the post-earthquake reconstruction but also became a permanent organization, tasked with promoting disaster management and disaster risk reduction throughout the state of Gujarat.

The Louisiana Recovery Authority took on responsibility for recovery from other disasters that occurred after the one for which it was created.

Recommendation 2: *Emphasize data management, communication, transparency, and accountability.*

Along with money, information is the fuel of the recovery process. Successful recovery requires reliable data; communication among organizations and with recovery stakeholders, actors, and the public; transparency; and accountability. Transparent communication should underlie all recovery management policies and actions. Many of the following recommendations are amplifications of this general principle. Information helps recovery participants make prudent decisions. Frequent and honest reports from recovery management organizations build trust between the government and the community. Transparency promotes accountability. Recovery management organizations should create public databases of all projects, as the BRR did in Aceh, to foster openness and equity at the local level.

Recommendation 3: *Plan and act simultaneously.*

Although planning needs to start right away, deliberative planning should not consume so much time and so many resources that it significantly impedes reconstruction. Planning and action need to happen in parallel through a constant learning process that involves continuous monitoring, evaluating, and correcting. Three ways to accomplish this are to

- increase planning capacity by hiring more staff and encouraging more citizen involvement;
- decentralize information gathering and decision processes; and
- revise planning decisions over time.

To be fast and smart, decision making must be distributed among all the recovery actors and take full advantage of local knowledge and capacity.

China's pairing system is a good example of both decentralization and increased planning capacity. Gujarat, Kobe, Yogyakarta, and the United

States illustrate increasing planning capacity by hiring local community planners. Kobe's categorization of disaster restoration promotion areas, New Zealand's liquefaction hazard zones, and the Area Development Authorities in Bhuj all show how planning decisions can be revised over time, based on the characteristics of damage, hazards, and reconstruction needs.

Recommendation 4: *Budget for the costs of communication and planning; revise budgets over time.*

This recommendation is the inevitable but often overlooked result of recommendations 1 and 3. Collecting data, creating media to communicate with stakeholders, providing technical advice to owners, and conducting community-level planning are critical to a successful recovery process, but they are costly. Budgets need to allocate funding for

- additional costs for information, data, communication, public involvement, and planning;
- revision over time, because initial budgets will often need updating; and
- contingencies, because time compression creates a high probability of mistakes.

Indonesia's BRR invested in data collection and communication as critical parts of its recovery management. New Zealand's SCIRT is a flexible contracting arrangement that recognizes the inevitable uncertainties of speedy reconstruction and the frequent need to revise budgets.

Recommendation 5: *Increase capacity and empower local governments to implement recovery actions.*

National governments are important sources of money, technical support, guidance, and oversight, but local governments are best suited to implement recovery and devise actions appropriate to their needs. Indonesia's BRR provides a positive example of empowering local governments. In the United States, tensions continue to exist among federal, state, and local governments.

This logic of local empowerment extends to property owners. Housing reconstruction is best done by owners if they have the capacity to do so. Governments can provide technical support to enhance local capacity. Owner-driven housing reconstruction was successful in India and Indonesia, especially as these countries gained experience through a succession of disasters. Success, however, requires commitment; technical assistance, such as a network of facilitators and advocates; information infrastructure; and an adequate budget for these resources.

Various types of NGOs operating at several levels can play important roles in improving community capacity to recover from disasters. In New Orleans, the Rockefeller Foundation helped to provide staffing support to overworked city agencies; the Greater New Orleans Foundation helped fund planning and community improvement activities; and the Neighborhood Partnership Network supported peer-to-peer learning among neighborhood organizations. In Gujarat, Abhiyan mobilized the collective capacity of its member NGOs to facilitate owner-driven reconstruction and rental housing provision; numerous NGOs—many of them faith-based—built rural housing and community facilities; and the Asian Development Bank built local capacity by funding training programs for engineers and masons.

Recommendation 6: *Avoid permanent relocation of residents and communities except in rare instances, and then only with full participation of residents.*

Numerous scholars have documented the challenges of community relocations. Residents are attached to their homes, and relocation also disrupts social and economic networks. Furthermore, relocation can impede access to residents' livelihoods. Evidence of the challenges and shortcomings of relocation can be seen in the controversy over relocations after the Latur earthquake in Maharashtra; unoccupied new post-disaster housing units in Beichuan, China, and in Tamil Nadu; the difficulty in developing new livelihoods for households displaced by the eruption of Indonesia's Mount Merapi; and the ongoing challenges of buying out earthquake-damaged lands and implementing the central-city rebuilding vision in Christchurch, New Zealand.

Sometimes, relocation of homes and communities is necessary if the existing site is unsafe or suffers from poor access to livelihoods and services. If in situ reconstruction is too daunting, relocation programs must be voluntary, and residents should fully participate in the process.

Recommendation 7: *Reconstruct quickly, but do not be hasty.*

Rapid reconstruction is important, but recovery organizations should resist the temptation to emphasize speed at the expense of deliberation and citizen involvement. Recommendation 3 says that planning should not stand in the way of reconstruction, but it also stresses the need for continuous deliberation while rebuilding.

Many governments and stakeholders assume that it is important to quickly rebuild as many houses as possible. The number of rebuilt housing units, however, is a poor indicator of recovery success. It takes time to develop site layouts, locations, and interior designs that meet the needs of residents. Housing also needs to be designed as a part of communities,

The Kobe Luminaria, a massive light installation held every year since the earthquake in 1995, celebrates community recovery from the devastation. Photo by Laurie Johnson (2013).

with access to livelihoods, support services, and social networks. Rebuilding too quickly can preclude effective resident involvement and provoke dissatisfaction.

China's reconstruction after the 2008 earthquake, for example, overemphasized the need for speedy reconstruction and ignored many other social and economic concerns. Kobe also emphasized rapid reconstruction of many new housing units on land that was readily available, such as the site of an old steel mill, rather than building on sites that were accessible to social networks and existing transportation systems.

PLANNING FOR RECOVERY FROM FUTURE DISASTERS

The purpose of this book has been to find common lessons from different parts of the world in order to help communities better organize for recovery after disasters. Recovery after a great disaster is always complex, takes a very long time, and is never fast enough for affected residents. However, the process can be improved in several ways, including setting more realistic expectations at the outset, working to restore communities and economies quickly and equitably, empowering stakeholders to participate in the process, ensuring governance for recovery over the long term, and reducing the risk of future disasters.

Large city disasters are becoming more common as the world rapidly urbanizes. Coastal areas are increasingly at risk because of the continuing growth of coastal populations and the effects of climate change. But large disasters can provide opportunities for long-term betterment as money flows to devastated areas. The urban development decisions made after great disasters can shape cities for years to come. A farsighted community thinks about the recovery process before the next disaster and discovers ways to reduce risk or at least to ease the recovery process. Thinking ahead improves the ability of the community to survive, adapt, and recover.

Acknowledgments

This book synthesizes two decades of research in six different countries, which involved collecting hundreds of documents and interviewing countless government officials, academic researchers, representatives of international aid organizations, community leaders, and disaster survivors. We are deeply indebted to all these people who shared their valuable time with us, often while facing the stresses of post-disaster recovery. In each country, a few key people were instrumental in organizing our visits and providing us with access to key informants, and we would like to recognize them here: Zhou Bo (Sichuan University); Braven Zhang (Beijing Normal University); our Wenchuan earthquake research team of Yu Xiao (Texas A&M University), Yang Zhang (Virginia Tech University), and Yan Song (University of North Carolina); Ljubica Mamula Seadon (formerly Ministry of Civil Defence and Emergency Management, New Zealand); David Johnston (Massey University); Tim Howe (Ocean Partners); Tom O'Rourke (Cornell University); Lianne Dalziel and Carolyn Ingles (City of Christchurch); Michael Theelan (formerly City of Christchurch); Nick Rogers (Tonkin and Taylor); Rod Cameron (Stronger Christchurch Infrastructure Rebuild Team); Simon Markham (Waimakariri District Council); Roger Sutton and Benesia Smith (formerly Canterbury Earthquake Recovery Authority); Haruo Hayashi and Norio Maki (Kyoto University); Kanako Iuchi (Tohoku University); Yoshimi Amakawa (Kinmokusei/Co-Plan); Ikuo Kobayashi (Kobe Yamate University); Kazuyoshi Ohnishi

(Kobe University); Toshikazu Ota (City of Kobe); Pungky Sumadi, Togu Pardede, and Suprayoga Hadi (Bappenas); Venkatachalam Thiruppugazh (Gujarat State Disaster Management Authority); B. R. Balachandran (formerly of the Environmental Planning Collaborative); Saket Sarraf (CEPT University); David Mammen (formerly of the Institute of Public Administration); Ken Topping (California Polytechnic State University); Jeffrey Hebert (City of New Orleans); Steven Bingler and Bobbie Hill (Concordia); Jeffrey Thomas (Thomas Strategies); Dina Long (Borough of Sea Bright, New Jersey); Matt Campbell (Federal Emergency Management Agency); Scott Davis (U.S. Department of Housing and Urban Development); and the dozens of people we previously acknowledged in *Clear as Mud: Planning for the Rebuilding of New Orleans*.

This material is based on work supported by numerous sources, including the National Science Foundation (under Grant Nos. CMMI 1030332, 0758310, and 9730137), the Mid-America Earthquake Center, the Public Entity Risk Institute, the Research Board of the University of Illinois at Urbana-Champaign, the Greater New Orleans Foundation, the New Orleans Redevelopment Authority, the Kyoto University Disaster Prevention Research Institute, the American Planning Association, the Borough of Sea Bright, New Jersey, the Federal Emergency Management Agency, Massey University, the City of Christchurch, Waimakariri District Council, the Canterbury Earthquake Recovery Authority, the Center for Global Partnership of the Japan Foundation, the Tohoku University International Research Institute of Disaster Science, the Earthquake Engineering Research Institute, the Geotechnical Extreme Events Reconnaissance Association, and the MIT China Planning Network.

Words are inadequate to express our continuing gratitude to the late William A. Anderson (National Science Foundation, National Academies, World Bank) for all the many ways in which he supported our work for two decades.

Finally, we are very grateful for the funding and support of the Lincoln Institute of Land Policy and want to especially thank our program director, Armando Carbonell, and our editor, Emily McKeigue, for their perseverance in seeing this project through to completion and publication.

References

Abe, S. 2014. "Meeting of the Reconstruction Promotion Council." Prime Minister of Japan and His Cabinet. *The Prime Minister in Action*. September 16. *http://japan.kantei.go.jp/96_abe/actions/201409/16article1.html*.

Abhiyan and UNDP (United Nations Development Programme). 2001. *Coming Together: A Brief Document on the Post-earthquake Rehabilitation Efforts by Various NGOs Working in Kutch.* Kutch Nav Nirman Abhiyan.

Abramson, D., and Y. Qi. 2011. "'Urban-Rural Integration' in the Earthquake Zone: Sichuan's Post-disaster Reconstruction and the Expansion of the Chengdu Metropole." *Pacific Affairs* 84 (3): 495–523.

ACARP (Aceh Community Assistance Research Project). 2007. *The Acehnese Gampong Three Years On: Assessing Local Capacity and Reconstruction Assistance in Post-tsunami Aceh*. Jakarta: AusAID, BRR, UNDP, Oxfam, Muslim Aid, Catholic Relief Services, World Bank, Syiah Kuala University.

Alesch, D., L. Arendt, and J. Holly. 2009. *Long-Term Community Disaster Recovery: Managing in the Aftermath*. Fairfax, VA: Public Entity Risk Institute.

Aryadi, D. (assistant to the mayor of Padang for economic development), and M. Asnulza (director of Padang housing reconstruction). 2012. Interview by R. Olshansky, Padang, West Sumatra (October 9).

Asahi Shimbun. 2012. "Experts Say M9 Nankai Trough Earthquake Would Kill Hundreds of Thousands—AJW by the *Asahi Shimbun*." (August 30).

Asian Development Bank, United Nations, and World Bank. 2005. *India Post Tsunami Recovery Program Preliminary Damage and Needs Assessment*. New Delhi.

Bagli, Charles V. 2008. "Mayor Seeks to Disband Lower Manhattan Panel." *New York Times*, September 11. *www.nytimes.com/2008/09/11/nyregion/11rebuild.html?pagewanted=print*.

Baker, Richard. 2005. *Louisiana Recovery Corporation Act*. House Resolution 4100, 109th Congress (2005–2006). Introduced October 20; died in session. Washington, DC: U.S. Congress. *https://www.govtrack.us/congress/bills/109/hr4100*.

Balachandran, B. 2010. "Planning the Reconstruction of Bhuj." In *Recovering from Earthquakes: Response, Reconstruction, and Impact Mitigation in India*, ed. S. B. Patel and A. Revi, 159–203. New Delhi: Routledge.

Bappenas. 2005. *Indonesia: Damage and Loss Assessment, the December 26, 2004 Natural Disaster.* Jakarta.

Bappenas, Governments of Yogyakarta, Governments of Central Java, and International Partners. 2006. *Preliminary Damage and Loss Assessment, Yogyakarta and Central Java Natural Disaster.* Jakarta.

Barenstein, J. D. 2006. *Housing Reconstruction in Post-earthquake Gujarat: A Comparative Analysis.* Humanitarian Practice Network, Overseas Development Institute. London: Overseas Development Institute.

———. 2008. "From Gujarat to Tamil Nadu: Owner-Driven vs. Contractor-Driven Housing Reconstruction in India." Paper presented at the Fourth International i-Rec Conference, "Building Resilience: Achieving Effective Post-disaster Reconstruction," Christchurch, New Zealand (April 2008).

Bayudono, M. (secretary of the Yogyakarta TPT). 2012. Interview by R. Olshansky, Yogyakarta, Indonesia (October 7).

Bearak, B. 2005, November 27. "The Day the Sea Came." *New York Times Magazine*, November 27. *www.nytimes.com/2005/11/27/magazine/27tsunami1.html?pagewanted=all*.

Bennett, B., J. Dann, E. Johnson, and R. Reynolds, eds. 2014. *Once in a Lifetime: City-Building After Disaster in Christchurch*. Christchurch: Freerange Press.

Blakely, E. J. 2012. *My Storm: Managing the Recovery of New Orleans in the Wake of Katrina*. Philadelphia: University of Pennsylvania Press.

Blanco, K. 2005. *Executive Order KBB05-63: Louisiana Recovery Authority*. Baton Rouge: Governor's Office, State of Louisiana. *www.doa.la.gov/osr%5Cother%5Ckbb05-63.htm*.

BNPB (National Agency for Disaster Management). 2009. *Indonesia National Disaster Management Plan, 2010–2014.* Jakarta.

———. ca. 2010. *Indonesia National Disaster Management Plan, 2010–2014.* Jakarta.

———. 2012. *Data & Informasi Bencana Indonesia.* Jakarta.

BNPB, Bappenas, Provincial and District/City Governments of West Sumatra and Jambi, and International Partners. 2009. *West Sumatra and Jambi Natural Disasters: Damage, Loss and Preliminary Needs Assessment.* Jakarta: Global Facility for Disaster Reduction and Recovery, World Bank.

Bollard, A., and S. Rachhod. 2011. "Economic Impacts of Seismic Risk: Lessons for Wellington." Paper presented at "Organisational Effectiveness in Times of Seismic Risk," Rotary Club and Victoria University, Wellington, New Zealand (October 18).

Boyd, E. 2010. *Community Development Block Grant Funds in Disaster Relief and Recovery*. RL33330. Washington, DC: Congressional Research Service.

Brown, J. T., F. X. McCarthy, and E. C. Liu. 2013. *Analysis of the Sandy Recovery Improvement Act of 2013*. CRS Report for Congress R42991. Washington, DC: Congressional Research Service. *https://www.fas.org/sgp/crs/misc/R42991.pdf*.

Brownlee, G. 2010. "Govt Welcomes Recovery Roadmap for Canterbury." October 21. *http://beehive.govt.nz/release/govt-welcomes-recovery-roadmap-canterbury*.

———. 2011a. "Around 10,000 Houses Will Need to Be Rebuilt." March 8. *http://beehive.govt.nz/release/around-10000-houses-will-need-be-rebuilt*.

———. 2011b. "Waimakariri District Land Decisions Released." August 18. *www.beehive.govt.nz/release/waimakariri-district-land-decisions-released*.

———. 2013. "TC3 Options and Solutions Making Great Strides." February 15. *http://beehive.govt.nz/release/tc3-options-and-solutions-making-great-strides*.

Brownlee, G., and T. Ryall. 2011. "Paper 1: Canterbury Earthquake Recovery: Proposed Governance Arrangements." New Zealand Office of the Minister of Canterbury Earthquake Recovery and Office of the Minister of State Services. *www.eqrecoverylearning.org/assets/downloads/rec4002-cabinet-paper-1-proposed-governance-arrangements-march-2012.pdf*.

BRR (Badan Rehabilitasi dan Rekonstruksi). 2005. *Aceh and Nias One Year After the Tsunami: The Recovery Effort and Way Forward*. Banda Aceh.

———. 2009a. *Economy*. Banda Aceh.

———. 2009b. *Housing: Roofing the Pillars of Hope*. Banda Aceh.

———. 2009c. *Story: Feat of the Daunting Launch*. Banda Aceh.

———. 2009d. *10 Management Lessons for Host Governments Coordinating Post-disaster Reconstruction*. Banda Aceh.

———. 2009e. *Tsunami*. Banda Aceh.

———. 2009f. *Book C—Map*. Banda Aceh.

———. 2009g. *Breakthrough: Thousands of Paths Toward Resolution*. Banda Aceh.

BRR and Partners. 2006. *Aceh and Nias Two Years After the Tsunami: 2006 Progress Report*. Banda Aceh.

BRR, BAPPEDA Aceh Province, and World Bank. 2008. *The Impact of the Conflict, the Tsunami and Reconstruction on Poverty in Aceh*. Jakarta: World Bank Office Jakarta.

Cairns, Lois. 2015. "Too Much Red Tape in Planning Rules." *Press*, April 13. *www.stuff.co.nz/the-press/business/the-rebuild/67708860/too-much-red-tape-in-planning-rules-ministers-say.html*.

CCDU (Christchurch Central Development Unit). 2012. "Christchurch Central Recovery Plan: Te Mahere 'Maraka Ōtautahi." CERA and Christchurch City Council. *https://www.otakaroltd.co.nz/assets/Uploads/christchurch-central-recovery-plan-march-2014-a4.pdf*.

Central Disaster Management Council. 2011. *Report of the Committee for Technical Investigation on Countermeasures for Earthquakes and Tsunamis Based on the Lessons Learned from the "2011 off the Pacific Coast of Tohoku Earthquake."* Tokyo: Cabinet Office of Japan.

CERA (Canterbury Earthquake Recovery Authority). 2011. "Government Response to the August 2011 Draft of the Central City Plan." September 28. *www.rebuildchristchurch.co.nz/i/5f0e19f2bc2d873c.pdf*.

———. 2012a. "Further Red Zone Properties Addressed." *www.rebuildchristchurch.co.nz/blog/2012/9/beehive-further-red-zone-properties-addressed*.

———. 2012b. *Recovery Strategy for Greater Christchurch: Mahere Haumanutanga O Waitaha*. *http://cera.govt.nz/sites/default/files/common/recovery-strategy-for-greater-christchurch.pdf*.

———. 2013a. "An Accessible City—Christchurch Central Recovery Plan: Replacement Transport Chapter." *https://www.otakaroltd.co.nz/assets/Projects/Project Documents/an-accessible-city-replacement-transport-chapter-october-2013.pdf*.

———. 2013b. "Land Use Recovery Plan—Te Mahere Whakahaumanu Taone." *http://ceraarchive.dpmc.govt.nz/sites/default/files/Documents/land-use-recovery-plan.pdf*.

———. 2014a. "Greater Christchurch Recovery: Briefing to Incoming Ministers." *http://cera.govt.nz/sites/default/files/common/greater-christchurch-recovery-briefing-to-incoming-ministers-2014.pdf*.

———. 2014b."Greater Christchurch Recovery Update 29." Newsletter of Canterbury Earthquake Recovery Authority. February.

———. 2015a. "Greater Christchurch Earthquake Recovery: Transition to Regeneration." *www.eqrecoverylearning.org/assets/downloads/rec2056-cera-transition-recovery-plan-october-2016.pdf*.

———. 2015b. "A Liveable City—Christchurch Central Recovery Plan: Replacement Transport Chapter." *https://www.otakaroltd.co.nz/assets/BalanceOfLand/christchurch-central-recovery-plan-residential-chapter-30-january-2015.pdf*.

———. 2015c. "Lyttelton Port Recovery Plan: Te Mahere Whakarauora I Te Puaha O Ohinehou." November. *www.lpc.co.nz/wp-content/uploads/2015/09/Lyttelton-Port-Recovery-Plan.pdf*.

———. 2015d. "Public Sector Rebuild: Programme of Work as at June 2015." *http://cera.govt.nz/sites/default/files/common/public-sector-rebuild-programme-of-works-june-2015.pdf*.

———. 2015e. "Residential Red Zone Offer Recovery Plan." *http://cera.govt.nz/sites/default/files/common/residential-red-zone-offer-recovery-plan-2015-07-30.pdf*.

Chandrasekhar, D. 2010. "Understanding Stakeholder Participation in Post-disaster Recovery (Case Study: Nagapattinam, India)." Ph.D.dissertation, University of Illinois at Urbana-Champaign.

Chandrasekhar, D., Y. Zhang, and Y. Xiao. 2014. "Nontraditional Participation in Disaster Recovery Planning: Cases from China, India, and the United States." *Journal of the American Planning Association* 80 (4): 373–384.

Chang, S. E. 2001. "Structural Change in Urban Economies: Recovery and Long-Term Impacts in the 1995 Kobe Earthquake." *Kokumin Keizai Zasshing (Journal of Economics and Business Administration)* 183 (1): 47–66.

Chen, R. 2011. "A Family in Beichuan." *Beijing Review*, May 11. *www.bjreview.com.cn/Cover_Stories_Series_2011/2011-05/11/content_357022.htm*.

China Academy of Urban Planning and Design. 2011. *Building a New Beichuan*. Beijing: China Architecture and Building Press.

China Daily. 2008a. "Beichuan County Town to Be Made a Memorial." May 23. *www.chinadaily.com.cn/china/2008-05/23/content_6707116.htm*

———. 2008b. "China Issues Guidelines on Post-quake Reconstruction." July 6. *www.chinadaily.com.cn/china/2008-07/06/content_6822540.htm*.

———. 2008c. "How to Fight Disasters in Future." June 26. *www.chinadaily.com.cn/opinion/2008-06/26/content_6796139.htm*.

———. 2008d. "ICBC Provides $1.17b Loans for Quake Zone." July 2. *www.chinadaily.com.cn/bizchina/2008-07/02/content_6813343.htm*.

———. 2008e. "Mapping Out the Case for Relocation." July 16. *http://en.bcnq.com/cndy/2008-07/16/content_6849751.htm*.

———. 2008f. "People's Roles Key to Rebuilding." June 25. *www.chinadaily.com.cn/bizchina/2008-06/25/content_6794244.htm*.

———. 2008g. "Real Challenges for Rebuilding Quake Zone." August 19. *www.chinadaily.com.cn/bizchina/2008-08/19/content_6949547.htm*.

———. 2008h. "Rebuilding Homes Top Priority for Quake Relief." June 17. *www.chinadaily.com.cn/bizchina/2008-06/17/content_6767302.htm*.

———. 2008i. "Special Supplement: 'People-First' Plan to Govern Sichuan." August 9. *www.chinadaily.com.cn/cndy/2008-08/09/content_6918976.htm*.

———. 2008j. "30b Yuan Offered for Farmers to Rebuild Homes." June 13. *www.chinadaily.com.cn/bizchina/2008-06/13/content_6758911.htm*.

———. 2008k. "UN Asks for $33.5m for Relief Work." July 17. *www.chinadaily.com.cn/cndy/2008-07/17/content_6852967.htm*.

———. 2008l. "Uncertainty over Best Relocation Plan for Wenchuan." July 9. *www.chinadaily.com.cn/china/2008-07/09/content_6829795.htm*.

———. 2008m. "Urban Relocation Best for Rural Quake Victims: Official." July 7. *www.chinadaily.com.cn/bizchina/2008-07/07/content_6825112.htm*.

———. 2008n. "Vice Premier Outlines Eight-Year Plan for Quake." June 24. *http://www.bjreview.com.cn/print/txt/2010-02/11/content_246603.htm*.

China View. 2009. "Villagers Begin Relocation for New County Seat of Quake-Leveled County." February 7. *chinaview.cn*.

Chisolm, J. 2012. *Independent Fisheries Limited et al. vs. Minister for Canterbury Earthquake Recovery*, NZHC 1909. High Court of New Zealand Christchurch Registry.

Christchurch City Council. 2006. *Central City Revitalisation Strategy—Stage II*. Christchurch.

———. 2011. *Draft Central City Plan*. Vols. 1 and 2. *http://canterbury.royalcommission.govt.nz/documents-by-key/20111006.33*.

———. 2015. *Long-Term Plan 2015–2025*. *www.ccc.govt.nz/the-council/plans-strategies-policies-and-bylaws/plans/long-term-plan/long-term-plan-2015-25/*.

———. 2016. *New Christchurch District Plan. https://ccc.govt.nz/the-council/plans-strategies-policies-and-bylaws/plans/districtplans/christchurch-district-plan/.*

Christie, C. 2012. "Governor Christie Names Marc Ferzan to Manage Hurricane Sandy Storm Recovery." Press Conference. November 28. *www.state.nj.us/governor/news/news/552012/approved/20121128d.html.*

———. 2013. "Distributing the Resources New Jersey Needs for the Rebuilding Process." Press Release. April 29. *http://nj.gov/governor/news/news/552013/pdf/20130429d.pdf.*

———. 2014. "Christie Administration Announces Federal Approval of Plan to Distribute Second Round Sandy Recovery Funds." Press Release. June 2. *www.state.nj.us/governor/news/news/552014/approved/20140602c.html.*

City of Kobe. 1995. "Kobe City Restoration Plan (Abridged Version)." June. Japan.

———. 2003. "The Great Hanshin-Awaji Earthquake Statistics and Restoration Progress." Current as of January 1. Japan.

———. 2010. "Comprehensive Strategy for Recovery from the Great Hanshin-Awaji Earthquake." March. Japan. *http://www.city.kobe.lg.jp/safety/hanshinawaji/revival/promote/img/English.pdf.*

———. 2012. "The Great Hanshin-Awaji Earthquake Statistics and Restoration Progress." Current as of January 1. Japan. *www.city.kobe.lg.jp/safety/hanshinawaji/revival/promote/january.2012.pdf.*

City of New Orleans. 2006. "2007 Annual Budget." New Orleans.

———. 2007. "Target Area Development Plan." Draft, September 27. New Orleans.

———. 2008. "2009 Annual Budget." *www.cityofno.com/Resources/2008mayorsbudget.pdf.*

———. 2010. "Plan for the 21st Century: New Orleans 2030 Plan." *www.nola.gov/city-planning/master-plan/.*

City of New Orleans, Mayor's Office. 2014. "City Surpasses Blight Reduction Milestone of 10,000 Units by 2014." Press Release. January 9. *www.nola.gov/mayor/press-releases/2014/20140109-blight/.*

City of Rikuzentakata. 2011. Disaster Recovery Plan, Japan.

Cleary, Gerard. 2014. "Adopting and Implementing a Legislative Framework for Recovery." In *Once in a Lifetime: City-Building after Disaster Christchurch,* 136–44. Christchurch: Freerange Press.

Cosgrave, J. 2007. *Synthesis Report: Expanded Summary, Joint Evaluation of the International Response to the Indian Ocean Tsunami.* London: Tsunami Evaluation Coalition.

Cuomo, A. 2013a. "Governor Cuomo Announces Community Reconstruction Zones Funded by Federal Supplemental Disaster Aid to Guide Local Rebuilding Process." April 26. *www.governor.ny.gov/press/04262013cuomo-reconstruction-federal-disaster-aid.*

———. 2013b. "Governor Cuomo Designates 102 New York Rising Communities Eligible to Receive More than $750 Million for Storm Reconstruction." Press Release. July 18. *www.governor.ny.gov/news/governor-cuomo-designates-102-new-york-rising-communities-eligible-receive-more-750-million.*

———. 2013c. "2013 State of the State." *https://www.governor.ny.gov/news/transcript-governor-andrew-m-cuomos-2013-state-state-address*.

———. 2014. "Governor Cuomo Hosts Conference to Present NY Rising Community Reconstruction Plans." Press Release. April 23. *https://www.governor.ny.gov/news/governor-cuomo-hosts-conference-present-ny-rising-community-reconstruction-plans*.

Dai, S. 2012. *Learning from the 2008 Wenchuan Earthquake's Recovery and Reconstruction Planning*. Shanghai: Tongji University, Shanghai, College of Architecture and Urban Planning.

Dalziel, L. 2011. "Turning Disasters into Opportunity." Keynote address presented at the Australian and New Zealand Institute of Insurance and Finance Conference, Auckland, New Zealand (November 30).

———. 2015. "Announcement of Mayor Dalziel's 2015–2025 LTP Proposal." June 5. *http://resources.ccc.govt.nz/files/TheCouncil/mayor/AnnouncementofMayorLianneDalziels2015-2025LTPproposal.pdf*.

Deng, F. 2010. "Post-disaster Reconfiguration of Property Rights in a Transition Economy." *Post-Communist Economies* 22 (2): 193–206.

DHS (U.S. Department of Homeland Security). 2006. *A Performance Review of FEMA's Disaster Management Activities in Response to Hurricane Katrina*. Office of Inspections and Special Reviews. OIG-06-32. *www.oig.dhs.gov/assets/Mgmt/OIG_06-32_Mar06.pdf*.

Dixon, L., N. Clancy, B. Bender, A. Kofner, D. Manheim, and L. Zakaras. 2013. *Flood Insurance in New York City Following Hurricane Sandy*. RR328. Santa Monica, CA: Rand Corporation.

Dong, X. 2012. "Post-disaster Recovery and Sustainable Development: A Lesson from the Wenchuan Earthquake, China, 2008." MUP Thesis. Urbana: University of Illiinois at Urbana-Champaign.

Donze, Frank. 2007. "NORA Granted 'Quick Take' Power." *New Orleans Times-Picayune*, May 18. *www.nola.com/timespic/stories/index.ssf?/base/library-125/1179473118135750.xml&coll=1*.

Dunford, M., and L. Li. 2011. "Earthquake Reconstruction in Wenchuan: Assessing the State Overall Plan and Addressing the 'Forgotten Phase.'" *Applied Geography* 31: 998–1009.

Durkin, Erin. 2014. "City Is Slacking on Hurricane Sandy Aid for Homeowners: Report." *New York Daily News*, February 24. *www.nydailynews.com/new-york/hurricane-sandy/exclusive-city-slacking-sandy-aid-homeowners-article-1.1699538*.

Edgington, David. 2010. *Reconstructing Kobe: The Geography of Crisis and Opportunity*. Vancouver, BC: UBC Press.

EERI (Earthquake Engineering Research Institute). 2008. *Learning from Earthquakes: The Wenchuan, Sichuan Province, China Earthquake of May 12, 2008*. Oakland, CA.

———. 2010. *Learning from Earthquakes: The Mw 7.1 Darfield (Canterbury), New Zealand Earthquake of September 4, 2010*. EERI Special Earthquake Report.

Oakland, CA. *www.eeri.org/site/images/eeri_newsletter/2010_pdf/EERI_NewZealand_EQRpt-web.pdf*.

———. 2011. *Learning from Earthquakes: The M 6.3 Christchurch, New Zealand, Earthquake of February 22, 2011*. EERI Special Earthquake Report. Oakland, CA. *www.eeri.org/site/images/eeri_newsletter/2011_pdf/EERI_NewZealand_EQRpt_web.pdf*.

Environment Canterbury. 2013. "Natural Environment Recovery Programme for Greater Christchurch." Christchurch: Environment Canterbury Regional Council.

EQC (New Zealand Earthquake Commission). 2011. "EQC Passes $1 Billion Mark." *www.eqc.govt.nz/news/eqc-passes-1b*.

———. 2013. "Earthquake Commission 2009–2010 Annual Report." *www.eqc.govt.nz/sites/public_files/eqc-annual-report-2009-10.pdf*.

———. 2014. "EQC Welcomes Declaratory Judgment Ruling." *www.eqc.govt.nz/news/eqc-welcomes-declaratory-judgment-ruling*.

———. 2016. "Progress and Updates, Canterbury Earthquakes." *www.eqc.govt.nz/canterbury-earthquakes/progress-updates*.

Evans, Neil. 2001. "Community Planning in Japan: The Case of Mano, and Its Experience in the Hanshin Earthquake." Doctoral thesis, School of East Asian Studies, University of Sheffield.

Fahmi, E. (BRR Spatial Planning). 2008. Interview by R. Olshansky, Banda Aceh, Aceh, Indonesia (June 26).

Fauzon, D. (member of the West Sumatra TPT). 2012, October 9. Interview by R. Olshansky, Padang, West Sumatra, Indonesia (October 9).

FEMA (Federal Emergency Management Agency). 2005. *Long-Term Recovery Planning Process: A Self-Help Guide*. Washington, DC.

———. 2008. "National Response Framework." Washington, DC: Department of Homeland Security. *www.FEMA.gov/*.

———. 2009. "National Disaster Housing Strategy." *www.fema.gov/pdf/emergency/disasterhousing/NDHS-core.pdf*.

———. 2011. "National Disaster Recovery Framework: Strengthening Disaster Recovery for the Nation." *www.fema.gov/pdf/recoveryframework/ndrf.pdf*.

———. 2013. "National Response Framework." Washington, DC: Department of Homeland Security. *www.fema.gov/library/viewRecord.do?id=7371*.

———. 2015a. "Hurricane Sandy by the Numbers." October 9. *www.fema.gov/media-library-data/1446042082195-179d93a1d9f3ca512de588ebf4091336/Sandy_anniv3_by_the_numbers.pdf*.

———. 2015b. "Mississippi Recovery Office | FEMA.gov." Last updated July 7, 2015. *www.fema.gov/mississippi-recovery-office*.

Feng, J. 2008, July 28. "Reconstructing Step by Step." *Beijing Review* 31. *www.bjreview.com.cn/special/2008-07/28/content_144767.htm*.

Fraiche, Donna. 2007. "Testimony of Donna Fraiche, Member of the Board of the Louisiana Recovery Authority: Before the Subcommittee on Disaster Recovery,

Committee on Homeland Security and Governmental Affairs, U.S. Senate." Washington, DC, April 12.

Freedman, A. 2013. "U.S. Dominated Global Disaster Losses in 2012: Swiss Re." *Climate Central*. April 1. *www.climatecentral.org/news/us-dominated-global-disaster-losses-in-2012-insurer-reports-15814*.

Friedman, M., and E. O'Neill. 2014. "Christie Hurricane Sandy 'Storm Czar' Marc Ferzan to Resign." *Star-Ledger*, Newark, NJ, July 8. *www.nj.com/politics/index.ssf/2014/07/christies_storm_czar_mark_ferzan_to_resign.html*.

Fugate, Craig. 2013. Hearing titled Hurricane Sandy: Getting the Recovery Right and the Value of Mitigation. U.S. Senate Committee on Homeland Security and Governmental Affairs. Washington, DC. March 20. *www.dhs.gov/news/2013/03/20/written-testimony-fema-administrator-craig-fugate-senate-committee-homeland-security*.

Fukushima Prefectural Government. 2011. "Meeting Minutes of Investigation Committee for Fukushima Prefecture Recovery Plan." Fukushima, Japan.

Gair, B. 2013. *NYC Recovery.* Hearing titled United States Senate Subcommittee on Homeland Security Meeting: Rebuilding After Hurricane Sandy. March 1. Washington, DC: U.S. Senate.

GAO (General Accounting Office). 2003. *September 11: Overview of Federal Disaster Assistance to the New York City Area*. GAO 04-72. Washington, DC. *www.gao.gov/assets/160/157488.pdf*.

GAO (Government Accountability Office). 2007. *Preliminary Information on Rebuilding Efforts in the Gulf Coast: Testimony Before the Committee on Homeland Security and Governmental Affairs, U.S. Senate*. GAO-07-809R. Washington, DC. *www.gao.gov/new.items/d07809r.pdf*.

———. 2008a. *Actions Taken to Implement the Post-Katrina Emergency Management Reform Act of 2006*. GAO-09-59R. Washington, DC. *www.gao.gov/new.items/d0959r.pdf*.

———. 2008b. *Disaster Recovery: FEMA's Public Assistance Grant Program Experienced Challenges with Gulf Coast Rebuilding*. GAO-09-129. Washington, DC. *http://www.gao.gov/assets/290/284493.pdf*.

———. 2008c. "Gulf Opportunity Zone: States Are Allocating Federal Tax Incentives to Finance Low-Income Housing and a Wide Range of Private Facilities." Report to the Committee on Finance, U.S. Senate, and the Committee on Ways and Means, House of Representatives. GAO-08-913. Washington, DC. *www.gao.gov/new.items/d08913.pdf*.

———. 2009a. *Gulf Coast Disaster Recovery: Community Development Block Grant Program Guidance to States Needs to Be Improved*. GAO-09-541. Washington, DC. *http://www.gao.gov/assets/300/291291.pdf*.

———. 2009b. *Office of the Federal Coordinator for Gulf Coast Rebuilding: Perspectives and Observations*. Briefing Slides presented at the Briefing to the Senate Committee on Homeland Security and Governmental Affairs, Washington, DC (April 10). GAO-09-411R. *www.gao.gov/new.items/d09411r.pdf*.

GCR and Associates. 2007. "Population Estimates for Orleans Parish, July 2007." *www.grc1.com/resettlement_trends_july07.htm*.

Ge, Y., Y. Gu, and W. Deng. 2010. "Evaluating China's National Post-disaster Plans: The 2008 Wenchuan Earthquake's Recovery and Reconstruction Planning." *International Journal of Disaster Risk Science* 1 (2): 17–27.

Geddis, A. 2010. "An Open Letter to New Zealand's People and Their Parliament." *Pundit*, September 28. *http://pundit.co.nz/content/an-open-letter-to-new-zealands-people-and-their-parliament*.

Gehl Architects. 2009. "Christchurch 2009: Public Space, Public Life." *https://ccc.govt.nz/the-council/plans-strategies-policies-and-bylaws/urbandesign/jan-gehl-public-life-study*.

George, A. (director, NGO Coordination and Resource Center). 2008. Interview by R. Olshansky, Nagapattinam, Tamil Nadu, India (January 18).

GNOCDC (Greater New Orleans Community Data Center). 2009. "GNOCDC Helps New Orleans Secure Millions in Federal Funding; Census Bureau Boosts 2007 Estimate by Almost 50,000 Based on GNOCDC Data." January 14. *http://app.e2ma.net/campaign/3b7b6b705fc2f081f41b8073ccf98389*.

GNO Inc. (Greater New Orleans Inc.). 2010. "2009 Year-in-Review." Regional Economic Alliance. *http://bcno.org/wp-content/uploads/2010/01/gno2009review.pdf*.

Goldstein, W., A. Peterson, and D. A. Zarrilli. 2014. "One City, Rebuilding Together." City of New York. *http://www1.nyc.gov/assets/home/downloads/pdf/reports/2014/sandy_041714.pdf*.

GOSR (Governor's Office of Storm Recovery). 2016. "NY Rising 2012–2016: 4th Anniversary Report." *https://stormrecovery.ny.gov/sites/default/files/crp/community/documents/10292016_GOSR4thAnniversary.pdf*.

Government of China. 2008. "Official Answers Press Questions on Public Opinion Solicitation of State Overall Planning for Post-Wenchuan Earthquake Restoration and Reconstruction." August 18. Chinese Government's Official Web Portal. *www.gov.cn/english/2008-08/18/content_1073986.htm*.

Government of Gujarat. 2003. *The Gujarat State Disaster Management Act, 2003*. Gujarat, India.

Government of India. 2005. *Tsunami—A Report to the Nation*. New Delhi.

Governor's Commission on Recovery, Rebuilding, and Renewal. 2005. "After Katrina: Building Back Better than Ever." *http://mississippirenewal.com/documents/Governors_Commission_Report.pdf*.

GSDMA (Gujarat State Disaster Management Authority). 2002. *Gujarat Emergency Earthquake Reconstruction Project, Environmental and Social Analysis*. Gandhinagar.

———. 2006. *Quarterly Progress Report, World Bank, January–March 2006, Gujarat Emergency Earthquake Reconstruction Project*. Gandhinagar.

———. n.d. *Kutch Rehabilitation After the Earthquake: Story of Human Resilience and Endeavour*. Gandhinagar.

Gupta, L., M. Gupta, A. Sinha, and V. K. Sharma. 2002. *Gujarat Earthquake, 26th January, 2001*. New Delhi: Indian Institute of Public Administration, National Center for Disaster Management.

Haas, J. E., R. W. Kates, and M. J. Bowden. 1977. *Reconstruction Following Disaster*. Cambridge, MA: MIT Press.

Hadi, S. (director for special areas and disadvantaged regions, Bappenas). 2008. Interview by R. Olshansky, Jakarta, Indonesia (June 23).

Hadiwigeno, S. (member of Tim Teknis Nacional). 2008. Interview by R. Olshansky, Yogyakarta, Indonesia (June 30).

Hammer, D. 2010. "New Orleans Redevelopment Authority Gets $30 Million Federal Grant to Fight Blight." *New Orleans Times-Picayune*, January 14. *www.nola.com /politics/index.ssf/2010/01/new_orleans_redevelopment_auth.html*.

Hanshin-Awaji Earthquake Reconstruction Fund. 1999. Phoenix Hyogo: Reconstruction from the Great Hanshin-Awaji Earthquake. Hyogo Prefecture, Kobe City, February 1999.

Harrald, J. 2012. "Emergency Management Restructured: Intended and Unintended Outcomes of Actions Taken Since 9/11." In *Emergency Management: The American Experience, 1900–2010*, 2nd ed., ed. C. B. Rubin, 167–190. Boca Raton, FL: CRC Press.

Hartevelt, J. 2011. "All Power to Cera as Bill Passes." *Stuff.co.nz*, April 15, Politics sec. *www.stuff.co.nz/national/politics/4890566/All-power-to-Cera-as-bi*.

High Court of New Zealand. 2011. "*Earthquake Commission v The Insurance Council of New Zealand Inc, Vero Insurance New Zealand Ltd, IAG New Zealand Ltd* (CIV-2011-485-1137), *Tower Insurance Ltd v Earthquake Commission* (CIV-2011-485-1116)." Press Summary. *www.interest.co.nz/sites/default/files/EQC-Press%20 summary%20020911-1.pdf*.

Hogue, H. B. 2005. *Federal Hurricane Recovery Coordinator: Appointment and Oversight Issues*. RS22334. Washington, DC: Congressional Research Service. *www .au.af.mil/au/awc/awcgate/crs/rs22334.pdf*.

Holbein, A. 2009. "Building a Recovery Department: New Orleans Attacks Blight Through Code Enforcement." *Planning*, 36–39. February.

Homma, M. 2004. "Disaster Reconstruction Resources." In *Assessment Reports of the Global Assessment of Earthquake Countermeasures*, 6:127–157. Kobe, Japan: Hyogo Prefectural Government.

Howden-Chapman, P., A. Pearson, R. Goodyear, E. Chisholm, K. Amore, G. Rivera-Munoz, and E. Woodbury. 2014. "The Inverse Care Law." In *Once in a Lifetime: City-Building After Disaster Christchurch*, ed. B. Bennett, J. Dann, E. Johnson, and R. Reynolds, 190–198. Christchurch: Freerange Press.

Hsing, Y.-T. 2010. *The Great Urban Transformation: Politics of Land and Property in China*. Oxford: Oxford University Press.

Hu, J. 2009. "Current Status and Prospects of China's Disaster Reduction Capability." Paper presented at the "Workshop on the Framework of Long-Term Capacity Building for Disaster Risk Reduction in APEC (Asia-Pacific Economic Cooperation)," Taipei, Taiwan, November 30–December 1.

Hu, Y. 2010. "Erasing the Horror of Disaster." Xinhuanet. February 10. *http://news.xinhuanet.com/english2010/china/2010-02/10/c_13170583.htm*.

Huang, L. (director, International Research Studio, China Academy of Urban Planning and Design). 2012. Interview by R. Olshansky, San Francisco, CA (December 3).

HUD (U.S. Department of Housing and Urban Development). 2014. "CDBG-DR Active Disaster Grants and Grantee Contact Information." *HUD Exchange*. *https://www.hudexchange.info/cdbg-dr/cdbg-dr-grantee-contact-information/*.

Hui, D. L. 2009. "Research Note: Politics of Sichuan Earthquake 2008." *Journal of Contingencies and Crisis Management* 17(2): 137–140.

Hurricane Sandy Rebuilding Task Force. 2013. "Hurricane Sandy Rebuilding Strategy: Stronger Communities, A Resilient Region." Washington, DC: U.S. Department of Housing and Urban Development. *http://portal.hud.gov/hudportal/HUD?src=/press/press_releases_media_advisories/2013/HUDNo.13-125*.

———. 2014. "Hurricane Sandy Rebuilding Strategy: Progress Report." Washington, DC: U.S. Department of Housing and Urban Development. *http://portal.hud.gov/hudportal/documents/huddoc?id=HurrSandRebStratPRF2014.pdf*.

Hyogo Prefecture. 1999a. "Damage Caused by the Great Hanshin-Awaji Earthquake and the Current Status of the Reconstruction." 1999 Consular Summit, March 8. Kobe, Japan.

———. 1999b. "Project Expenditures of Hanshin-Awaji Earthquake Disaster Restoration Plan (Hyogo Phoenix Plan)." Kobe, Japan.

III (Insurance Information Institute). 2016. "Hurricanes." *www.iii.org/fact-statistic/hurricanes*.

Ikeguchi, K., and T. Yamamoto. 1999. "Housing Planning and Public Projects." In *Proceedings of the 6th Japan/United States Workshop on Urban Earthquake Hazard Reduction*, 383–399. Kobe, Japan: Institute of Social Safety Science and Earthquake Engineering Research Institute.

IMDFF-DR (Indonesia Multi-Donor Fund Facility for Disaster Recovery). 2011. *Action Plan for Rehabilitation and Reconstruction, Merapi: Build Back Safer.* Jakarta.

———. 2012. *Merapi Volcanic Eruption Livelihoods Recovery Programme.* Jakarta.

Innes, J. E., and D. E. Booher. 2010. *Planning with Complexity: An Introduction to Collaborative Rationality for Public Policy*. New York: Routledge.

International Recovery Platform. 2009. *The Yogyakarta and Central Java Earthquake, 2006*. Kobe, Japan: Asian Disaster Reduction Center.

IPET (Interagency Performance Evaluation Task Force). 2009. *Performance Evaluation of the New Orleans and Southeast Louisiana Hurricane Protection System*. IPET Risk and Reliability Report. Washington, DC: U.S. Army Corps of Engineers. *http://nolarisk.usace.army.mil/*.

IRS (U.S. Internal Revenue Service). 2014. "New York Liberty Zone Bonds." *IRS*. April 22. *www.irs.gov/Government-Entities/New-York-Liberty-Zone-Bonds*.

Ito, M. 2012. "11 Months On, Reconstruction Agency Makes Official Debut." *Japan Times*, February 11. www.japantimes.co.jp/news/2012/02/11/news/11-months-on-reconstruction-agency-makes-official-debut/.

Ito, Z. 2004. "Reconstruction Organizations." In *Assessment Reports of the Global Assessment of Earthquake Countermeasures*, 6:41–90. Kobe, Japan: Hyogo Prefectural Government.

Iuchi, K., L. A. Johnson, and R. B. Olshansky. 2013. "Securing Tohoku's Future: Planning for Rebuilding in the First Year Following the Tohoku-Oki Earthquake and Tsunami." *Earthquake Spectra* 29 (S1): S479–499. *doi:http://dx.doi.org/10.1193/1.4000119.*

Iuchi, K., E. Maly, and L. Johnson. 2015. "Three Years After a Mega-disaster: Recovery Policies, Programs and Implementation After the Great East Japan Earthquake." In *Post-Tsunami Hazard Reconstruction and Restoration*, 29–46. Cham, Switzerland: Springer.

Iwate Prefecture. 2011. *Iwate Prefecture Great East Japan Earthquake and Tsunami Reconstruction Plan: Basic Reconstruction Plan*. Morioka, Japan.

Jacobs, A. 2009. "In Year After Quake, China Sealed an Opened Door." *New York Times*, May 12. *https://mobile.nytimes.com/2009/05/13/world/asia/13quake.html.*

Jaffe, B. E., J. C. Borrero, G. S. Prasetya, R. Peters, B. McAdoo, G. Gelfenbaum, R. Morton, P. Ruggiero, B. Higman, L. Dengler, R. Hidayat, E. Kingsley, W. Kongko, Lukijanto, A. Moore, V. Titov, and E. Yuliantom. 2006. "Northwest Sumatra and Offshore Islands Field Survey After the December 2004 Indian Ocean Tsunami." *Earthquake Spectra* 22 (S1): S105–S135.

Jain, S. K., W. R. Lettis, C. Murty, and J.-P. Bardet. 2002. "Introduction to special issue on the Bhuj, India, earthquake." *Earthquake Spectra* 18 (S1): 1–4.

Japan Cabinet Office. 2011a. "Disaster Management in Japan." Director General for Disaster Management, Cabinet Office. *www.bousai.go.jp/1info/pdf/saigaipanf_e.pdf.*

———. 2011b. "White Paper on Disaster Management 2011: Executive Summary (Provisional Translation)." Cabinet Office, Government of Japan. *www.bousai.go.jp/kaigirep/hakusho/pdf/WPDM2011_Summary.pdf.*

Japan Ministry of Construction, City Bureau. 2000. "Urban Development Project in Japan, Third Edition." City Bureau, Ministry of Construction, Japan Land Readjustment Association.

Japan Ministry of Foreign Affairs. 2011. "Reconstruction Design Council Recommends Means of Rebuilding Northeastern Japan Areas Hit by Disasters." Japan Foreign Policy Update 18.

Japan Statistics Bureau. 2016. "Japan Statistical Yearbook 2016—Chapter 2, Population and Households." Tokyo. *www.stat.go.jp/english/data/nenkan/65nenkan/1431-02.htm.*

Java Reconstruction Fund. 2008. *Two Years After the Java Earthquake and Tsunami: Implementing Community Based Reconstruction, Increasing Transparency.* Jakarta.

———. 2011. *Java Reconstruction Fund Progress Report, 2011, Building on Success: Effectively Responding to Multiple Disasters.* Jakarta: JRF Secretariat.

———. 2012. Java Reconstruction Fund Website, "About History." October 22. Jakarta: World Bank. *www.javareconstructionfund.org/index.php.*

JER (Japan Earthquake Reinsurance Company). 2016 *Japan Earthquake Reinsurance Co., Ltd. Annual Report, 2016*. Tokyo. *http://nihonjishin.co.jp/english/2016/en_disclosure.pdf*.

Jiang, W. 2014. "Towns Undergoing Changes: A Case Study on the Recovery After the Wenchuan Earthquake, China." Master's thesis, University of Illinois at Urbana-Champaign.

Jigyasu, R. 2002. "From Marathwada to Gujarat—Emerging Challenges in Post-earthquake Rehabilitation for Sustainable Eco Development in South Asia." Proceedings of the conference "Improving Post-disaster Reconstruction in Developing Countries," University of Montreal (May 23–25).

Jing, F. 2008. "Sichuan Plan to House Millions." *China Daily*, July 2. *www.chinadaily.com.cn/bizchina/2008-07/02/content_6813091.htm*.

Johnson, L. A., and L. Mamula-Seadon. 2014. "Transforming Governance: How National Policies and Organizations for Managing Disaster Recovery Evolved Following the 4 September 2010 and 22 February 2011 Canterbury Earthquakes." *Earthquake Spectra* 30 (1): 557–605. *doi:http://dx.doi.org/10.1193/032513EQS078M*.

Kahoku Newspaper. 2011. "Miyagi Prefecture Raises Building Moratoria Today—Transiting to New Restrain for Recovery." November 1.

Kaihara, T. (former governor of Hyogo Prefecture). 2014. Interview by L. Johnson on recovery governance issues after the 1995 Kobe earthquake. October 27. Kobe, Japan: Disaster Research Institute.

Kanamori, H. 2006. "Seismological Aspects of the December 2004 Great Sumatra-Andaman Earthquake." *Earthquake Spectra* 22 (S3): S1–S12.

Katz, B. 2014. "How Washington Made Itself Irrelevant." *Washington Post*, December 5, Opinion ed. *www.brookings.edu/research/opinions/2014/12/05-washington-irrelevant-katz*.

Ke, S. 2008. "Quake Relief and Post-disaster Reconstruction in China." *China City Planning Review* 17 (3): 8–9.

Key, J. 2010. "Speech Notes on Canterbury Earthquake." Post-Cabinet Press Conference. September 6. *www.beehive.govt.nz/speech/post-cabinet-press-conference-speech-notes-canterbury-earthquake*.

———. 2011. "John Key Press Conference." June 14. *www.stuff.co.nz/the-press/news/christchurch-earthquake-2011/5143720/John-Key-press-conference*.

Key, J., and G. Brownlee. 2011. "Earthquake Recovery Options." June 23. *http://beehive.govt.nz/release/video-prime-minister-john-key-and-earthquake-recovery-minister-gerry-brownlee-earthquake-rec*.

King, A., D. Middleton, C. Brown, D. Johnston, and S. Johal. 2014. "Insurance: Its Role in Recovery from the 2010–2011 Canterbury Earthquake Sequence." *Earthquake Spectra* 30 (1): 475–491. *doi:http://dx.doi.org/10.1193/022813EQS058M*.

King, R. O. 2013. *The National Flood Insurance Program: Status and Remaining Issues for Congress*. CRS Report for Congress R42850. Washington, DC: Congressional Research Service. *https://www.fas.org/sgp/crs/misc/R42850.pdf*.

Kingsbury, D. 2007. "The Free Aceh Movement: Islam and Democratisation." *Journal of Contemporary Asia* 37 (2): 166–189.

Kinmokusei, International Project Working Group. 1999. "Key Terminology in Restoration from Hanshin Earthquake Disaster." Kobe, Japan: Kinmokusei.

Kobayashi, I. 2007. "Machizukuri (Community Development) for Recovery Whose Leading Role Citizens Play." *Journal of Disaster Research* 2 (5): 359–371.

Konigsmark, A. R. 2006. "New Orleans Universities Seeing Real Homecoming: Students Back in Greater Numbers than Expected." *USA Today*, October 31, Final ed., News sec. *http://usatoday30.usatoday.com/educate/college/arts/articles/20060115.htm*.

Kopplin, A. D. 2007. *Written Testimony of Andrew D. Kopplin, Executive Director of the Louisiana Recovery Authority*. U.S. Senate Committee on Homeland Security and Governmental Affairs, Subcommittee on Disaster Recovery. Washington, DC: U.S. Senate. *https://www.hsgac.senate.gov/download/052407kopplin*.

Kosar, K. 2005. *Disaster Response and Appointment of a Recovery Czar: The Executive Branch's Response to the Flood of 1927, CRS Report for Congress*. RL33126. Washington, DC: Congressional Research Service.

Kyodo. 2013. "Trillions for Rebuilding Tohoku Go Unused." *Japan Times*, July 31, National ed. *www.japantimes.co.jp/news/2013/07/31/national/trillions-for-rebuilding-tohoku-go-unused/#.WL8SYn-6VRw*.

———. 2014. "35 Percent of Japan's Reconstruction Budget for Tsunami Areas Going Unused." *Japan Times*, July 31, National ed. *www.japantimes.co.jp/news/2014/07/31/national/35-of-japans-reconstruction-budget-for-tsunami-areas-going-unused*.

Law, T. 2015. "Christchurch Does Not Want 'Wasteful White Elephant' Projects." *Press*, May 20. *www.stuff.co.nz/the-press/news/68671472/christchurch-does-not-want-wasteful-white-elephant-projects*.

Li, X. (president of the China Academy of Urban Planning and Design). 2012. Interview by R. Olshansky, San Francisco, CA (December 3).

Lianying, L. 2008. "SDB Boosts Dujiangyan Tourism with 700m Yuan." *China Daily*, June 19. *www.chinadaily.com.cn/china/2008-06/19/content_6779033.htm*.

Lim, L. 2013. "Five Years After a Quake, Chinese Cite Shoddy Construction." National Public Radio, May 13. *www.npr.org/blogs/parallels/2013/05/14/183635289/Five-Years-After-A-Quake-Chinese-Cite-Shoddy-Reconstruction*.

Liu, A., and A. Plyer. 2009. *The New Orleans Index: Tracking the Recovery of New Orleans & the Metro Area*. Washington, DC: Brookings Institution and Greater New Orleans Community Data Center.

LLT (Louisiana Land Trust). 2015. "Louisiana Land Trust." *www.lalandtrust.us/*.

LMDC (Lower Manhattan Development Corporation). 2002a. "Lower Manhattan Development Corporation Names Louis R. Tomson as Executive Director." Press Release. January 10. *www.renewnyc.com/displaynews.aspx?newsid=bb0ac847-f14c-482b-94ef-982f7ac0fc75*.

———. 2002b. "Mayor Michael R. Bloomberg Announces Four Appointments to the Lower Manhattan Development Corporation Board." Press Release. April 9. *www.renewnyc.com/displaynews.aspx?newsid=bc965e76-1a35-42b7-9c9e-1f057e9be9fb*.

———. 2007. "Lower Manhattan Development Corporation World Trade Center Memorial and Cultural Program General Project Plan, June 2, 2004, as Amended February 14, 2007." *www.renewnyc.com/content/pdfs/GPPandSitePlan.pdf*.

Lochhead, H. 2014. "Winning Strategies for Climate Resilience: Helen Lochhead Considers Rebuild by Design." *Land Lines*, 1–9. July.

LRA (Louisiana Recovery Authority). 2007. "Louisiana Speaks Regional Plan: Visions and Strategies for Recovery and Growth in South Louisiana." Baton Rouge. *http://lra.louisiana.gov/index.cfm?md=subsite&tmp=home&ssid=1.*

———. 2008. "Louisiana Recovery Authority, Progress Report, October 2008." *http://lra.louisiana.gov/assets/docs/searchable/Quarterly%20Reports/October 08QuarterlyReport.pdf.*

———. 2010. "Louisiana Recovery Authority, 2005–2010." *http://lra.louisiana.gov /assets/docs/searchable/Quarterly%20Reports/FinalReportJune2010.pdf.*

Lu, J. 2012. "Understanding Civil Society: A Network Approach to NGO Activities in the Wenchuan Earthquake Recovery." Paper presented at the Annual Conference of the Association of Collegiate Schools of Planning, Cincinnati (November 1–4).

Maheshwari, B., M. Sharma, and J. Narayan. 2006. "Geotechnical and Structural Damage in Tamil Nadu, India, from the December 2004 Indian Ocean Tsunami." *Earthquake Spectra* 22 (S3): S475–S493.

Mammen, D. 2011. *Creating Recovery: Values and Approaches in New York After 9/11.* Tokyo: Fuji Technology Press.

Marine and Fire Association of Japan. 2002. Non-life Insurance in Japan Fact Book, 2001–2002. General Insurance Association of Japan, Tokyo.

Markham, S. 2012. "Waimakariri Recovery." Paper presented at the Meeting of the Multi-National Resilience Group, Kaiapoi, New Zealand (November).

———. 2014. "Business Recovery After Disaster: Lessons from the Waimakariri District Council." Paper presented at the Get Ready Week—Horowhenua District Council, Levin, New Zealand (September 25).

Martin, C. 2015. "Rebuild by Design: Lessons Learned from the Evaluation of HUD's Post-Sandy Resilience Design Competition." *Natural Hazards Observer*, 6–13. January.

Martin, D. 2015. "Final Report of the Crown Manager for Building Control at Christchurch City Council: Final Report." *www.dia.govt.nz/diawebsite.nsf/Files/Report-of-the-Crown-Manager-for-Building-Control-at-Christchurch-City-Council-18-March-2015/$file/Report-of-the-Crown-Manager-for-Building-Control-at-Christchurch-City-Council-18-March-2015.pdf.*

Masyrafah, H., and J. M. McKeon. 2008. *Post-tsunami Aid Effectiveness in Aceh: Proliferation and Coordination in Reconstruction.* Washington, DC: Brookings Institution, Wolfensohn Center for Development.

Matsuo, R., and K. Takamoto. 2011. "East Japan Earthquake Basic Recovery Act Is Approved . . . Framework Is Finally Ready." *Mainichi*, June 20.

Matthews, P. 2012. "Adrift in Limbo Land." *Press*, February 4. *www.stuff.co.nz/the-press/news/christchurch-earthquake-2011/6365644/Adrift-in-limbo-land.*

McClure, T. 2015. "Is Investor Confidence Waning in Christchurch?" *The Press*, April 21. *www.stuff.co.nz/business/industries/67873836/Is-investor-confidence-waning-in-Christchurch.*

McCrone, J. 2014. "Great Plan, but Where Are the Investors?" In *Once in a Lifetime: City-Building After Disaster Christchurch*, ed. B. Bennett, J. Dann, E. Johnson, and R. Reynolds, 101–108. Christchurch: Freerange Press.

———. 2015. "Will Heads Roll in Christchurch's Beleaguered Planning Department?" *The Press*, June 6. *www.stuff.co.nz/the-press/business/the-rebuild/68972257/will-heads-roll-in-christchurchs-beleaguered-planning-department*.

MCDEM (Ministry of Civil Defence and Emergency Management). 2005. "Recovery Management: Director's Guidelines for CDEM Groups." DGL 4/05. Wellington, New Zealand. *www.civildefence.govt.nz/assets/Uploads/publications/dgl-04-05-recovery-management.pdf*.

McDonald, L. 2015. "Christchurch's CBD Expected to Add 8000 New Workers in Next 2 Years." *The Press*, May 1. *www.stuff.co.nz/business/industries/67533851/christchurchs-cbd-expected-to-add-8000-new-workers-in-next-2-years*.

McLean, I., D. Oughton, S. Ellis, B. Wakelin, and C. Rubin. 2012. "Review of the Civil Defence Emergency Management Response to the 22 February Christchurch Earthquake." *www.civildefence.govt.nz/resources/review-of-the-civil-defence-emergency-management-response-to-the-22-february-christchurch-earthquake/*.

McQuaid, J., and M. Schleifstein. 2006. *Path of Destruction: The Devastation of New Orleans and the Coming Age of Superstorms*. New York: Little, Brown.

Mississippi Renewal Forum. 2005. "Rebuilding the Gulf Coast: Answering the Governor's Call for Recovery, Rebuilding and Renewal on the Mississippi Gulf Coast." The Town Paper. *www.tndtownpaper.com/gulf/Gulf_Coast_PreCharrette.pdf*.

Mitsui, Y. (former secretary of the National Land Agency). 2014. Interview by L. Johnson on national-level governance issues in disaster recovery after the 1995 Kobe earthquake. Tokyo, Japan Housing Finance Agency (October 28).

Miyagi Prefectural Government. 2011a. "About Coastal Levee Heights for Miyagi Prefecture Coast." Sendai, Japan.

———. 2011b. "Miyagi Prefecture Earthquake Disaster Recovery Plan: The Bond Between Miyagi, Tohoku and Japan—From Recovery to Prosperity, Summary." Sendai, Japan. *https://www.pref.miyagi.jp/uploaded/attachment/36634.pdf*.

MLIT (Ministry of Land, Infrastructure, Transport, and Tourism). 2011. "Current Situation of Coastal Levee Heights in the Three Affected Prefectures." Tokyo.

———. 2012a. "About East Japan Earthquake Recovery Subsidy (Tentative)." Tokyo.

———. 2012b. "Survey and Analysis on Recovery Approach for Tsunami Affected Lands." Tokyo.

Mukherji, A. 2008. "Negotiating Housing Recovery: Why Some Communities Recovered While Others Struggled to Rebuild in Post-earthquake Urban Kutch, India." Ph.D. dissertation, University of California, Berkeley.

———. 2010. "Post-earthquake Housing Recovery in Bhachhau, India: The Homeowner, the Renter, and the Squatter." *Earthquake Spectra* 26 (4): 1085–1100.

Multi-Donor Fund for Aceh and Nias. 2006. *Implementing Projects, Achieving Results: 18 Months of the Multi Donor Fund for Aceh and Nias*. Jakarta.

Multi-Donor Fund for Aceh and Nias and Java Reconstruction Fund. 2012. *Rekompak: Rebuilding Indonesia's Communities After Disasters*. Jakarta: World Bank.

Multi-Donor Trust Fund for Aceh and North Sumatra. 2005. *Unaudited Quarterly Financial Report No. 2, September 30, 2005.* MDTFANS Secretariat. Jakarta.

Murdoch, S. 2012. "Annual Review of the Canterbury Earthquake Recovery Act 2011." *http://cera.govt.nz/sites/default/files/common/canterbury-earthquake-recovery-act-2011-annual-review-2012.pdf.*

———. 2014. "Annual Review of the Canterbury Earthquake Recovery Act 2011." *http://cera.govt.nz/sites/default/files/common/canterbury-earthquake-recovery-act-2011-annual-review-2014.pdf.*

Murty, C., M. Greene, S. K. Jain, N. P. Prasad, and V. V. Mehta. 2005. *Earthquake Rebuilding in Gujarat, India.* Oakland, CA: Earthquake Engineering Research Institute.

Murty, C., S. Jain, A. R. Sheth, A. Jaiswal, and S. R. Dash. 2006. "Response and Recovery in India After the December 2004 Great Sumatra Earthquake and Indian Ocean Tsunami." *Earthquake Spectra* 22 (S3): S731–S758.

Nagai, T. (counselor, Headquarters for Recovery Response, Japan National Government). 2011. Interview by L. Johnson on national government organization for recovery after the 2011 Tohoku earthquake and tsunami. Tokyo: National Government Headquarters for Recovery Response. September 20.

Nagin, Ray, and Bring New Orleans Back Commission (BNOB). 2006. "Rebuilding New Orleans, Final Summary." New Orleans: City of New Orleans.

Nakabayashi, I. 2006. "Development of Urban Disaster Prevention Systems in Japan—from the Mid-1980s." *Journal of Disaster Research* 1 (1): 46–71.

Nakayama, H. 1999. "Collaborative Community Development After the Great Hanshin-Awaji Earthquake." In *Proceedings of the 6th Japan/United States Workshop on Urban Earthquake Hazard Reduction*, 312–317. Kobe, Japan: Institute of Social Safety Science and Earthquake Engineering Research Institute.

———. 2008. "Earthquake Recovery in Kobe City and the Roles of Local Government and Residents." In *Joint Research Project on the Assessment Methodology for Recovery Community Development: Final Report*, 12–21. UNCRD Disaster Management Planning Hyogo Office. Kobe, Japan: Asian Disaster Research Center, Disaster Reduction and Human Prevention Institution, International Recovery Platform, and UN Centre for Regional Development.

National Development and Reform Commission, State Council of China. 2008. *The State Overall Planning for Post-Wenchuan Earthquake Restoration and Reconstruction (Public Opinion Soliciting Draft).* Beijing: State Planning Group of Post-Wenchuan Earthquake Restoration and Reconstruction.

National Library of New Zealand. 2011. "Canterbury Earthquake Recovery Commission." *NLNZ Web Archive Viewer. http://ndhadeliver.natlib.govt.nz/ArcAggregator/arcView/frameView/IE4331348/http://www.cerc.govt.nz/.*

Naughton, B. 2009. *Understanding the Chinese Stimulus Package.* Stanford, CA: Hoover Institution.

Nemoto, T. 2014. "For Accelerating the Reconstruction from the Great East Japan Earthquake." Reconstruction Agency, Government of Japan. *www.reconstruction.go.jp/rap/2014/02/20140224_fpc.pdf.*

New Jersey Department of Community Affairs. 2015. "Superstorm Sandy Community Development Block Grant—Disaster Recovery, Amendment Number 11, Substantial Amendment for the Third Allocation of CDBG-DR Funds." *www.renewjerseystronger.org/wp-content/uploads/2015/04/APA-11-Non-RBD-Amendment-w-Comments-and-Responses-4-22-15.pdf*.

———. 2016. "Sandy Recovery Tracker." *www.renewjerseystronger.org/*.

New Jersey Governor's Office of Recovery and Rebuilding. 2014. "Governor's Office of Recovery and Rebuilding." State of New Jersey. *www.state.nj.us/gorr/index.shtml*.

New York State. n.d. "NY Rising Community Reconstruction Program Overview." *https://stormrecovery.ny.gov/sites/default/files/documents/NY-Rising-Community-Reconstruction-Program-Overview.pdf*.

New Zealand Cabinet. 2011. "Land Damage from the Canterbury Earthquakes." Cabinet Minute of Decision 11 (24/15). Wellington, New Zealand. *http://cera.govt.nz/sites/default/files/common/cabinet-paper-land-decisions-june-2011.pdf*.

———. 2013. "Findings of the Port Hills Zoning Review Advisory Group on the Port Hills Zoning Decisions." Cabinet Minute of Decision 13 (24/8). Wellington, New Zealand. *http://cera.govt.nz/sites/default/files/common/port-hills-zoning-review-cabinet-paper-findings-of-advisory-group-on-port-hills-zoning-decisions-20130715.pdf*.

New Zealand Cabinet Committee on Canterbury Earthquake Recovery. 2012. "Findings of the Canterbury Zoning Review Advisory Group, Minutes of Decision." *http://cera.govt.nz/sites/default/files/common/cabinet-minute-findings-of-zoning-review-20120824.pdf*.

New Zealand Court of Appeal. 2012. *Canterbury Regional Council vs. Independent Fisheries Limited and Others*. *https://www.courtsofnz.govt.nz/cases/independent-fisheries-ltd-clearwater-land-holdings-ltd-v-minister-for-canterbury-earthquake-recovery/@@images/fileDecision*.

New Zealand Government and Christchurch City Council. 2013. "Cost-Sharing Agreement." *http://cera.govt.nz/sites/default/files/common/cera-crown-ccc-cost-sharing-agreement-2013-12-05.pdf*.

New Zealand Legislation. 2014. *Canterbury Earthquake (Christchurch Replacement District Plan) Order 2014: Order in Council*. LI 2014/228. *http://legislation.govt.nz/regulation/public/2014/0228/latest/DLM6190883.html*.

New Zealand Office of the Auditor General. 2012. "Roles, Responsibilities, and Funding of Public Entities After the Canterbury Earthquakes." Parliamentary Paper. Wellington, New Zealand. *www.oag.govt.nz/2012/canterbury/2012/canterbury/docs/canterbury.pdf*.

———. 2013a. "Earthquake Commission: Managing the Canterbury Home Repair Programme." Wellington, New Zealand. *www.oag.govt.nz/2013/eqc/docs/oag-eqc-overview.pdf*.

———. 2013b. "Effectiveness and Efficiency of Arrangements to Repair Pipes and Roads in Christchurch." Wellington, New Zealand. *www.oag.govt.nz/2013/scirt/docs/oag-scirt.pdf*.

New Zealand Parliament. 1991. *Resource Management Act 1991. www.legislation.govt.nz/act/public/1991/0069/latest/DLM230265.html.*

———. 1993. *Earthquake Commission Act 1993. www.legislation.govt.nz/act/public/1993/0084/latest/DLM305968.html.*

———. 2002a. *Civil Defence Emergency Management Act 2002. www.legislation.govt.nz/act/public/2002/0033/latest/DLM149789.html.*

———. 2002b. *Local Government Act 2002. www.legislation.govt.nz/act/public/2002/0084/latest/DLM170873.html.*

———. 2004. *Building Act 2004. www.legislation.govt.nz/act/public/2004/0072/latest/DLM306036.html.*

———. 2009. *Resource Management (Simplifying and Streamlining) Amendment Act 2009. www.legislation.govt.nz/act/public/2009/0031/latest/DLM2218401.html.*

———. 2010a. *Canterbury Earthquake Response and Recovery Act 2010. www.legislation.govt.nz/act/public/2010/0114/latest/DLM3233004.html.*

———. 2010b. *Environment Canterbury (Temporary Commissioners and Improved Water Management) Act 2010. www.legislation.govt.nz/act/public/2010/0012/latest/DLM2850313.html?search=ts_act%40bill%40regulation%40deemedreg_Environment+Canterbury+%28Temporary+Commissioners+and+Improved+Water+Management%29+Act+2010_resel_25_h&p=1.*

———. 2011. *Canterbury Earthquake Recovery Act 2011. www.legislation.govt.nz/act/public/2011/0012/latest/DLM3653522.html.*

———. 2012. *Building Amendment Act 2012. www.legislation.govt.nz/act/public/2012/0023/latest/DLM3387709.html?search=sw_096be8ed80d5b7c4_earthquake-prone_25_se&p=1#DLM3387767.*

———. 2016. *Greater Christchurch Regeneration Act 2016. www.legislation.govt.nz/act/public/2016/0014/32.0/DLM6579202.html.*

New Zealand Supreme Court. 2015. *Quake Outcasts and Fowler Developments Ltd vs. the Minister CER and the Chief Executive of CERA. https://www.courtsofnz.govt.nz/cases/quake-outcasts-and-fowler-v-minister-for-canterbury-earthquake-recovery/@@images/fileDecision.*

Nielsen. 2014. "Wellbeing Survey." Christchurch, New Zealand: Canterbury Earthquake Recovery Authority. September. *https://www.cph.co.nz/wp-content/uploads/cerawellbeingsurveysept2014.pdf.*

Niino, K. (former president of Kobe University and chair of the Hyogo Prefecture Study Group for Urban Regeneration Strategy). 2014. Interview by L. Johnson on local and prefectural recovery governance issues after the 1995 Kobe earthquake. Kobe, Japan (October 27).

Nikolic-Brzev, S., M. Greene, F. Krimgold, and L. Seeber. Ca. 1999. *Lessons Learned over Time*. Vol. 2, *Innovative Earthquake Recovery in India*. Oakland, CA: Earthquake Engineering Research Institute.

Nimmich, J. L. 2013. *FEMA Reauthorization: Recovering Quicker and Smarter.* Washington, DC. *www.fema.gov/media-library-data/bb350d766a3dd4a4f8ecec0ccc783957/9-18-13_FEMA%20REAUTHORIZATION_RECOVERING%20QUICKER%20AND%20SMARTER.pdf.*

NORA (New Orleans Redevelopment Authority). 2007. "New Orleans Parish Redevelopment and Disposition Plan for Louisiana Land Trust Properties." New Orleans.

NWS (National Weather Service). 2006. "Service Assessment, Hurricane Katrina, August 23–31, 2005." *www.nws.noaa.gov/om/assessments/pdfs/Katrina.pdf*.

NYCEDC (New York City Economic Development Corporation). 2014. "The Rebirth of Lower Manhattan." November 4. *www.nycedc.com/blog-entry/rebirth-lower-manhattan*.

NYCIBO (New York City Independent Budget Office). 2011. "The Aftermath: Federal Aid 10 Years After the World Trade Center Attack." Fiscal Brief. New York. *www.ibo.nyc.ny.us/iboreports/wtc2011.pdf*.

NYC Recovery, City of New York. 2016. "NYC Sandy Funding Tracker." *http://www1.nyc.gov/sandytracker/*.

NZ DBH (New Zealand Department of Buildings and Housing). 2012. "What Do the Technical Categories Mean for You?" Transcript of Dave Kelly, Director of the Canterbury Rebuild of the Building and Housing Group. *https://www.youtube.com/watch?v=Uxc665Rfx_Q*.

NZ HRC (New Zealand Human Rights Commission). 2013. "Monitoring Human Rights in the Canterbury Earthquake Recovery." December. *https://www.hrc.co.nz/files/2114/2427/8929/HRC-Earthquake-Report-2013-final-for-web.pdf*.

———. 2016. "Staying in the Red Zones: Monitoring Human Rights in the Canterbury Earthquake Recovery." *https://www.hrc.co.nz/files/8614/7864/4133/HRC_Red_Zone_Report_2016.pdf*.

OECD (Organisation for Economic Co-operation and Development). 2004. *Large-Scale Disasters: Lessons Learned*. Paris. *www.oecd.org/futures/globalprospects/40867519.pdf*.

Office of Governor Haley Barbour. 2009. "4 Years After Katrina: Progress Report on Recovery, Rebuilding and Renewal." State of Mississippi. *www.msdisasterrecovery.com/documents/28.8.09FourYearsAfterKatrina.pdf*.

OIG (New Orleans Office of Inspector General). 2010. *Review of City of New Orleans Professional Services Contract with MWH Americas, Inc. for Infrastructure Project Management: Final Report*. OIG-I&E-09003(A). New Orleans.

Okamoto, M. (director general for reconstruction policy, Japan Reconstruction Agency). 2014. Interview by L. Johnson on the formation of the national Reconstruction Agency and other governance issues after the 2011 Tohoku earthquake and tsunami. Tokyo, Reconstruction Agency (October 29).

Olshansky, R. B., L. D. Hopkins, and L. A. Johnson. 2012. "Disaster and Recovery: Processes Compressed in Time." *Natural Hazards Review* 13: 173–178.

Olshansky, R. B., and L. A. Johnson. 2010. *Clear as Mud: Planning for the Rebuilding of New Orleans*. Chicago: American Planning Association.

Olshansky, R. B., L. A. Johnson, and K. C. Topping. 2006. "Rebuilding Communities Following Disaster: Lessons from Kobe and Los Angeles." *Built Environment* 32 (4): 354–374.

ORM (Office of Recovery Management). 2007. "Target Area Development Plan, Draft." City of New Orleans, LA.

Pacific Disaster Management Information Platform. 2012. *Indonesia*. Jakarta: Indonesia Ministry of Foreign Affairs.

Painter, W. L., and J. T. Brown. 2013. *Analysis of the Sandy Recovery Improvement Act of 2013*. CRS Report for Congress R42869. Washington, DC: Congressional Research Service. *https://www.fas.org/sgp/crs/misc/R42869.pdf*.

Peng, Y., L. Shen, C. Tan, D. Tan, and H. Wang. 2013. "Critical Determinant Factors (CDFs) for Developing Concentrated Rural Settlement in Post-disaster Reconstruction: A China Study." *Natural Hazards* 66: 355–373.

People's Government of Sichuan Province. 2008. "Total Investment for Reconstruction to Exceed RMB 1 Trillion." July 7. *http://english.sc.gov.cn/news/bignews/200807/t20080707_294726.shtml*.

Perez-Pena, R. 2001a. "Giuliani's Quest for a Term Extension Hits a Wall in Albany." *New York Times*, October 2. *www.nytimes.com/2001/10/02/nyregion/giuliani-s-quest-for-a-term-extension-hits-a-wall-in-albany.html*.

———. 2001b. "State Seeks to Play a Role in the Reconstruction Effort." *New York Times*, September 27. *www.nytimes.com/2001/09/27/nyregion/state-seeks-to-play-a-role-in-the-reconstruction-effort.html*.

Picciano, J. 2006. *Federal 9/11 Assistance to New York: Part I, II, and III*. Washington, D.C.: U.S. Government Printing Office. *www.gpo.gov/fdsys/pkg/CHRG-109hhrg35501/html/CHRG-109hhrg35501.htm*.

PlaNYC. 2013. *A Stronger, More Resilient New York*. New York: City of New York.

Powell, P. J. 2011. "Post-disaster Reconstruction: A Current Analysis of Gujarat's Response After the 2001 Earthquake." *Environmental Hazards* 10: 279–292.

Pranoto, S., R. K. Kayo, K. Syafruddin, D. Fauzan, Z. Ermiza, and S. Antoni. 2011. *Building Back Better: Lessons Learned, Rehabilitation and Reconstruction, West Sumatra, September 30th, 2009, Earthquake*. Padang, West Sumatra: Technical Support Team of the Rehabilitation and Reconstruction, National Agency for Disaster Management.

Prater, C., W. G. Peacock, S. Arlikatti, and H. Grover. 2006. "Social Capacity in Nagapattinam, Tamil Nadu After the December 2004 Great Sumatra Earthquake and Tsunami." *Earthquake Spectra* 22 (S3): S715–S729.

Purwanto, E. (deputy chair for operations, BRR). 2008. Interview by R. Olshansky, Banda Aceh, Aceh, Indonesia (June 25).

QV.co.nz. 2016. "Residential House Price Index." *www.qv.co.nz/resources/residential-house-price-index*.

Rainwater, Paul. 2009. "Testimony of Paul Rainwater, Executive Director of the Louisiana Recovery Authority and Governor Jindal's Authorized Representative to FEMA: Before the U.S. House Subcommittee on Economic Development, Public Buildings, and Emergency Management." Washington, DC.

Reconstruction Agency, Government of Japan. 2012. "Recovery Fund Allocation System." Tokyo.

———. 2016a. "Current Status of Reconstruction and Challenges," *www.reconstruction.go.jp/english/topics/Progress_to_date/pdf/201611_Current_Status_of_Reconstruction_and_Challenges.pdf,* November.

———. 2016b. "Situation Overview: Scope of Damages." *www.reconstruction.go.jp /english/topics/2013/03/about-us-situation-overview.html*.

Reconstruction Design Council. 2011. "Towards Reconstruction, 'Hope Beyond the Disaster.'" Report to the Prime Minister in response to the Great East Japan Earthquake. *www.mofa.go.jp/announce/jfpu/2011/7/pdfs/0712.pdf*.

Republic of Indonesia. 2005. *Master Plan for the Rehabilitation and Reconstruction of the Regions and Communities of the Province of Nanggroe Aceh Darussalam and the Islands of Nias, Province of North Sumatera.* Jakarta. *www.recoveryplatform .org/assets/submissions/200909020450_master_plan_for_reconstruction_ _government_of_indonesia__tsunami.pdf*.

Rogers, N., K. Williams, M. Jacka, S. Wallace, and J. Leeves. 2014. "Geotechnical Aspects of Disaster Recovery Planning in Residential Christchurch and Surrounding Districts Affected by Liquefaction." *Earthquake Spectra* 30 (1): 493–512. *doi:http://dx.doi.org/10.1193/021513EQS029M*.

Rosen, C. M. 1986. *The Limits of Power: Great Fires and the Process of City Growth in America*. Cambridge: Cambridge University Press.

Rubin, C. 2013. "Sandy Task Force Issues Recommendations for Long-Term Recovery." *Emergency Management*, November 27. *www.govtech.com/em/disaster /Sandy-Task-Force-Recommendations-Long-Term-Recovery.html*.

Rubin, C. B., M. D. Saperstein, and D. G. Barbee. 1985. *Community Recovery from a Major Natural Disaster*. Boulder: Program on Environment and Behavior, Institute of Behavioral Science, University of Colorado.

Sachdeva, S. 2012. "Protesters Threaten Rates Revolt in Christchurch." *Press*, February 2, National ed. *www.stuff.co.nz/national/6351630/Protesters-threaten-rates -revolt-in-Christchurch*.

Salazar, A. 1999. "Disasters, the World Bank, and Participation: Relocation Housing After the 1993 Earthquake in Maharashtra, India." *Third World Planning Review* 21 (1): 83–106.

———. 2001. "Of Housing Disasters in Developing Countries: Participatory Housing and Technology After the Marathwada (1993) Earthquake." Unpublished paper.

Sanderson, D., and A. Sharma. 2008. "Winners and Losers from the 2001 Gujarat Earthquake." *Environment and Urbanization* 20 (1): 177–186.

Sankei Newspaper. 2012. "Recovery Fund, Anger Rises as 'Project Will Delay,' Fukushima, Miyagi 40% Were Sent-Off." March 3. Sankei, Japan: Sankei Digital Inc.

Saptadi, G. (head of Housing Section, Ministry of Public Works, provincial office, Yogyakarta). 2008. Interview by R. Olshansky, Yogyakarta, Indonesia (June 30).

Sasayama, Y. (former mayor of the city of Kobe). 2009. Interview by L. Johnson on recovery management experiences after the 1995 Kobe earthquake. Kobe, Japan: City of Kobe. February 10.

SCIRT (Stronger Christchurch Infrastructure Rebuild Team). 2011. "Stronger Christchurch Infrastructure Rebuild Plan: How We Plan to Fix Our Earthquake Damaged Roads and Underground Services." Christchurch City Council. *http:*

//resources.ccc.govt.nz/files/canterburyearthquake/scirt-infrastructure-rebuild-plan_web.pdf.

Sharma, M. B. 2009. *Disaster as an Opportunity for Development of Social Impact Assessment of Gujarat Emergency Earthquake Reconstruction Project (GEERP).* Presented at National Seminar on Housing and Disaster Mitigation Efforts in India: Case Studies, April 18, 2009, Roorkee, India.

Shi, P., L. Lianyou, J. Wang, W. Xu, W. Fang, and M. Wang. 2013. "Experience, Lessons, and Recommendations of China's Response to the Wenchuan Earthquake Disaster." In *Integrated Risk Governance*, ed. P. Shi, C. Jaeger, and Q. E. Ye, 71–88. Beijing: Beijing Normal University Press.

Sikoki, B. 2012. Interview by R. Olshansky, Yogyakarta, Indonesia (October 6).

Small, V., and C. Meier. 2015. "EQC on Solid Ground—Review." *Press*, February 5, National ed. *www.stuff.co.nz/national/65799249/eqc-on-solid-ground—review.*

Smith, G. 2011. *Planning for Post-Disaster Recovery: A Review of the United States Disaster Assistance Framework*. Fairfax, VA: Public Entity Risk Institute.

Smith, G., and T. Birkland. 2012. "Building a Theory of Recovery: Institutional Dimensions." *International Journal of Mass Emergencies and Disasters* 30 (2): 147–170.

Smith, J. 2014. "Christchurch—A State of Emergency." In *Once in a Lifetime: City-Building After Disaster Christchurch*, ed. B. Bennett, J. Dann, E. Johnson, and R. Reynolds, 145–149. Christchurch: Freerange Press.

Sokol, D. 2008. "U.S. Firm Helps China Rebuild After Deadly Quake." *Architectural Record*, October 22. 196 (10): 38.

Soraya, G. (team leader for Aceh and Java reconstruction, World Bank). 2008. Interview by R. Olshansky, Jakarta, Indonesia (June 24).

Sorensen, A. 2002. *The Making of Urban Japan: Cities and Planning from Edo to the Twenty-First Century*. London: Routledge.

Spangle Associates. 1997. *Evaluation of Use of the Los Angeles Recovery and Reconstruction Plan After the Northridge Earthquake*. Portola Valley, CA: Spangle Associates.

State Council of the People's Republic of China. 2008a. *The Overall Planning for Post-Wenchuan Earthquake Restoration and Reconstruction*. Beijing.

———. 2008b. *Regulation on Restoration and Reconstruction in Wenchuan Earthquake Hit Regions*. Beijing.

Statistics New Zealand. 2010. *New Zealand Official Yearbook 2010*. 107th ed. *www.stats.govt.nz/browse_for_stats/snapshots-of-nz/digital-yearbook-collection/2010-yearbook.aspx*.

St. Clair, M., and D. McMahon. 2011. "Consideration of Liquefaction and Lateral Spreading Hazards in the Zoning and Development of: Part A: The Eastern Suburbs of Christchurch from 1977 to 22 Feb 2011; Part B: Brooklands, Kaiapoi and Kairaki/The Pines from 1977 to 4 Sept 2010." Christchurch, New Zealand: Hill Young Cooper and Resource Management Group.

Stylianou, G. 2015. "Land for Anchor Projects Reduced." *Press*, January 27. *www.stuff.co.nz/the-press/business/the-rebuild/65438602/Land-for-anchor-projects-reduced*.

Sutton, R. 2014. "A Blank Canvas for New Beginnings." In *Once in a Lifetime: City-Building After Disaster Christchurch*, ed. B. Bennett, J. Dann, E. Johnson, and R. Reynolds, 52–58. Christchurch: Freerange Press.

Tanfani, J. 2014. "Since Sandy, a Storm Pattern of Costly Stumbles in New Jersey." *Los Angeles Times*, June 20. *www.latimes.com/nation/la-na-disaster-recovery-20140620-story.html*.

Tatsuki, S. 2007. "Long-Term Life Recovery Processes Among Survivors of the 1995 Kobe Earthquake: 1999, 2001, 2003, and 2005 Life Recovery Social Survey Results." *Journal of Disaster Research* 2 (6): 484–501.

Te Rūnanga o Ngāi Tahu. 2016. "Te Rūnanga O Ngāi Tahu." *http://ngaitahu.iwi.nz/*.

Thiruppugazh, V. 2007. "Post-disaster Reconstruction and the Window of Opportunity." Paper presented at "Democracy, Development and Civil Society in India," Melbourne (September 20–21).

———. 2011. "When People Are Involved." In *Beyond Shelter: Architecture and Human Dignity*, ed. M. J. Aquilino, 70–81. New York: Metropolis Books.

Thiruppugazh, V., and S. Kumar. 2010. "Lessons from the Gujarat Experience for Disaster Mitigation and Management." In *Recovering from Earthquakes: Response, Reconstruction, and Impact Mitigation in India*, ed. S. B. Patel and A. Revi, 223–237. New Delhi: Routledge.

Tokyo Metropolitan Office. 1933. *The Reconstruction of Tokyo*. Tokyo: Kawaguchi Printing Works.

Tomioka, T. 1997. "Housing Reconstruction Measures from the Great Hanshin-Awaji Earthquake." *5th United States/Japan Workshop on Urban Earthquake Hazard Reduction*. Pasadena, CA: Earthquake Engineering Research Institute.

Tonkin and Taylor. 2010. "Darfield Earthquake 4 September 2010 Geotechncial Land Damage Assessment & Reinstatement Report, Stage 2 Report." Earthquake Commission Report. November. *www.tonkin.co.nz/canterbury-land-information/docs/T&T-Stage%202%20Report.pdf*.

Tsang, E., and J. But. 2013. "Hong Kong Activists Try to Block Quake Donations over Corruption Fears." *South China Morning Post*, April 23. *www.scmp.com/news/hong-kong/article/1220991/hong-kong-activists-try-block-quake-donations-over-corruption-fears*.

Tsuruki, K. (vice mayor of Kobe and board chief of city planning at the time of the 1995 earthquake). 2004. Interview by R. Olshansky, Kobe, Japan (March 9).

Ubaura, M. 2015. "Three Years After a Mega-disaster: Recovery Policies, Programs and Implementation After the Great East Japan Earthquake." In *Post-Tsunami Hazard Reconstruction and Restoration*, 15–28. Cham, Switzerland: Springer.

UNCRD (United Nations Centre for Regional Development). 1995. *Comprehensive Study of the Great Hanshin Earthquake*. Research Report 12. Nagoya, Japan.

UNDP (United Nations Development Programme) and BNPB (National Agency for Disaster Management). 2009. *Lessons Learned: Disaster Management Legal Reform, the Indonesian Experience.* Jakarta.

United Nations Development Programme (UNDP) and Bappenas. 2006. *Early Recovery Assistance (ERA) Programme for Yogyakarta and Central Java.* Jakarta.

United Nations in China and Ministry of Commerce of the People's Republic of China. 2008. *International Workshop on Post-earthquake Reconstruction Experiences, Workshop Synthesis.* Beijing: United Nations in China.

United Nations Team for Recovery Support. 2006. *Tsunami One Year After: A Joint UN Report—India.* Chennai.

UNOP (Unified New Orleans Plan). 2007. "Citywide Strategic Recovery and Rebuilding Plan, Final Draft." *www.unifiedneworleansplan.org/index.php.*

USAID (U.S. Agency for International Development). 2005. *INDIAN OCEAN—Earthquakes and Tsunamis.* Fact Sheet 39. July 7. *http://reliefweb.int/sites/reliefweb.int/files/resources/1A65BCCA7B72313285257037006 78FDE-usaid-asi-07jul.pdf.*

U.S. House of Representatives. 2006. *A Failure of Initiative: Final Report of the Select Bipartisan Committee to Investigation the Preparation for and Response to Hurricane Katrina.* Washington, DC: U.S. Government Printing Office. *www.gpoaccess.gov/congress/index.html.*

Vallance, S. 2013. *Waimakariri District Council's Integrated, Community-Based Recovery Framework*. www.eqrecoverylearning.org/assets/downloads/2013-05-01-res2020-wdc-intergrated-community-based-recovery-framework.pdf.

Valverde, L. J., and R. P. Hartwig. 2006. "9/11 and Insurance: The Five Year Anniversary." New York: Insurance Information Institute.

Vatsa, K. S. 2001. "Rhetoric and Reality of Post-disaster Rehabilitation After the Latur Earthquake of 1993: A Rejoinder." Unpublished paper.

———. 2002. "Government Response and Socioeconomic Impacts." *Earthquake Spectra* 18 (S1): 383–398.

Waggoner and Ball Architects. 2013. "The Greater New Orleans Urban Water Plan." November. *http://gnoinc.org/initiatives/the-greater-new-orleans-water-plan/.*

Waimakariri District Council. 2013. Earthquake Recovery Committee. "Agenda and Minutes." Rangiora, New Zealand. September 24.

———. 2016. "Waimakariri Residential Red Zone Recovery Plan: He Mahere Whakarauora I Te Whenua Rahui O Waimakariri." *www.redzoneplan.nz/__data/assets/pdf_file/0017/27062/DPMCWRRZRecoveryPlanWeb_v2pdf.pdf.*

Waizenegger, A., and J. Hyndman. 2010. "Two Solitudes: Post-tsunami and Post-conflict Aceh." *Disasters* 34 (3): 787–808.

Walsh, B. 2006. "White House Against Baker Bailout Bill; Bush Point Man Says Block Grants Enough." *New Orleans Times-Picayune*, January 25, National sec.

Wan, X. 2011. "The Experiences in Reconstruction and Regeneration after Wenchuan Earthquake." Paper presented at the 11th International Conference of the Asian Planning Schools Association, Tokyo (September 21).

Watanabe, S. 1984. "Metropolitanism as a Way of Life: The Case of Tokyo, 1868–1930." In *Metropolis, 1890–1940*, ed. A. Sutcliffe, 403–429. London: Mansell.

Wei, H. 2010, February 18. "The Wenchuan Phoenix." *Beijing Review* 7. *www.bjreview.com/Post_Wenchuan/2010-02/09/content_246176.htm.*

Wen, J. 2011. " 在汶川地震灾后恢复重建座谈会上的讲话." ["Speech made at the forum on post Wenchuan earthquake recovery and reconstruction."] May 9. *http://politics.people.com.cn/GB/1024/14590689.html.*

White House. 2005. "Executive Order 13390—Establishment of a Coordinator of Federal Support for the Recovery and Rebuilding of the Gulf Coast Region." *www.gpo.gov/fdsys/pkg/WCPD-2005-11-07/pdf/WCPD-2005-11-07-Pg1634.pdf*.

———. 2006. *The Federal Response to Hurricane Katrina—Lessons Learned*. Washington, DC.

———. 2012a. "Executive Order—Establishing the Hurricane Sandy Rebuilding Task Force." *www.whitehouse.gov/the-press-office/2012/12/07/executive-order-establishing-hurricane-sandy-rebuilding-task-force*.

———. 2012b. "Ongoing Response to Hurricane Sandy." November 15. *www.whitehouse.gov/the-press-office/2012/11/15/ongoing-response-hurricane-sandy*.

Williams, D. 2011. "Orange Zone Puts Futures on Hold." *Press*, July 25. *www.stuff.co.nz/the-press/news/christchurch-earthquake-2011/5332889/Orange-zone-puts-futures-on-hold*.

William Spangle and Associates. 1991. *Rebuilding After Earthquakes: Lessons for Planners*. Portola Valley, CA.

Winkler-Schmidt, D. 2007. "The Long Road Ahead: The New Orleans Redevelopment Authority 'NORA' Is Finally Getting Enough Money to Do Its Job. Is the Agency Ready?" *Gambit*, December 18. *www.bestofneworleans.com/gambit/the-long-road-ahead/Content?oid=1248863*.

Wood, A., I. Noy, and M. Parker. 2016. "The Canterbury Rebuild Five Years on from the Christchurch Earthquake." *Reserve Bank of New Zealand Bulletin*, February. *www.rbnz.govt.nz/-s/media/ReserveBank/Files/Publications/Bulletins/2016/2016feb79-3.pdf*.

World Bank. 2005. *Rebuilding a Better Aceh and NIAS*. Washington, DC.

———. 2008. "Workshop on Earthquake Recovery and Reconstruction: International Experience and Best Practices." June 12. *www.worldbank.org/en/news/feature/2008/06/12/workshop-on-earthquake-recovery-and-reconstruction-international-experience-and-best-practices*.

———. 2009. *Implementation Completion and Results Report (IDA-36370) on a Credit in the Amount of SDR 356.0 Million (US$442.8 Million Equivalent) to the Republic of India for a Gujarat Emergency Earthquake Reconstruction Project. http://documents.worldbank.org/curated/en/499871468050063960/text/ICR6380P074018101Official0Use0Only1.txt*.

———. 2012. "Supporting Post-earthquake Recovery in China." December 4. *www.worldbank.org/en/news/feature/2012/12/04/supporting-post-earthquake-recovery-in-china*.

World Bank and Asian Development Bank. 2001. *Gujarat Earthquake Recovery Program Assessment Report. www.preventionweb.net/files/2608_fullreport.pdf*.

WTC (World Trade Center). 2016. "News—World Trade Center." *www.wtc.com/news/*.

Xiao, Y., Y. Zhang, L. Johnson, R. Olshansky, and Y. Song. 2015. "Financing Rapid Community Reconstruction After Catastrophic Disaster: Lessons from the 2008 Wenchuan Earthquake in China." Unpublished paper, Texas A&M University.

Xinhua News Agency. 2008a. "China Quake Death Toll Remains Unchanged at 69,226." August 25. *http://news.xinhuanet.com/english/2008-08/25/content_9708034.htm*.

———. 2008b. "Red Cross Society of China Starts Rebuilding Projects in Quake-Hit Sichuan." August 14. *http://news.xinhuanet.com/english/2008-08/14/content_9318935.htm*.

———. 2008c. "Ten Million Quake Survivors Move into Prefabs." August 12. *http://news.xinhuanet.com/english/2008-08/12/content_9225935.htm*.

Yajima, T. 1999. Interview by R. Olshansky, L. Johnson, and K. Topping on condominium construction assistance, City of Kobe Housing Bureau, Kobe, Japan (July 9).

Yi, L., L. Ge, D. Zhao, J. Zhou, and Z. Gao. 2012. "An Analysis on Disasters Management System in China." *Natural Hazards* 60 (2): 295–309.

Yong, C., and D. C. Booth. 2011. *The Wenchuan Earthquake of 2008: Anatomy of a Disaster*. Beijing and Berlin: Science Press and Springer-Verlag.

Zhang, Q. 2008. Presentation to China Planning Network, Chengdu Bureau of Planning, Chengdu (July 17).

Zhang, Y., W. Drake, Y. Xiao, R. Olshansky, L. Johnson, and Y. Song. 2014. "Disaster Recovery Planning After Two Catastrophes: The 1976 Tangshan Earthquake and the 2008 Wenchuan Earthquake." *International Journal of Mass Emergencies and Disasters* 34 (2).

Zhang, Y., C. Zhang, W. Drake, and R. Olshansky. 2014. "Planning and Recovery Following the Great 1976 Tangshan Earthquake." *Journal of Planning History*. 14 (3): 224–243.

Zhe, Z. 2008. "Disaster Law to Reflect Experience." *China Daily*, June 17. *www.chinadaily.com.cn/cndy/2008-06/17/content_6765618.htm*.

Zheng, R. (project manager, Tsinghua Urban Planning and Design Institute). 2011. Interview by R. Olshansky, Beijing (June 23).

Zhu, Z., M. Li, and S. Huang, S. 2012. "Post-quake Reconstruction Planning and Implementation for Beichuan New Town." 48th ISOCARP Congress, Perm Russia, September 10–13.

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About the Authors

Laurie A. Johnson, Ph.D., AICP, is an internationally recognized urban planner specializing in disaster recovery and catastrophe risk management. She has an extensive portfolio of expertise in disaster recovery after earthquakes, landslides, floods, hurricanes, and human-made disasters across the United States and the world. In 2006, she was a lead author of the recovery plan for the city of New Orleans after Hurricane Katrina; she then coauthored the book *Clear as Mud: Planning for the Rebuilding of New Orleans* with Robert Olshansky. She is a lead author of the American Planning Association's guidebook *Planning for Post-Disaster Recovery: Next Generation* (2014). She is also a visiting project scientist at the Pacific Earthquake Engineering Center at the University of California, Berkeley. Her consultancy is based in San Rafael, California.

Robert B. Olshansky, Ph.D., FAICP, is professor and head of the Department of Urban and Regional Planning, University of Illinois at Urbana–Champaign, where he has taught for more than 27 years. He has published extensively on post-disaster recovery planning, policy for earthquake risks, hillside planning and landslide policy, and environmental impact assessment. He coauthored *Clear as Mud: Planning for the Rebuilding of New Orleans* with Laurie Johnson, as well as the report *Opportunity in Chaos: Rebuilding after the 1994 Northridge and 1995 Kobe Earthquakes* with Laurie Johnson and Ken Topping, and he edited the four-volume *Urban Planning After Disasters* (Routledge). He and collaborators, with support from the National Science Foundation and the University of Illinois, have also researched and published on disaster recovery in China, India, Indonesia, Haiti, and Japan.

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