

**GAO**

Report to the Committee on Homeland  
Security and Governmental Affairs,  
U.S. Senate

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July 2009

# DISASTER RECOVERY

## Experiences from Past Disasters Offer Insights for Effective Collaboration after Catastrophic Events



**GAO**

Accountability \* Integrity \* Reliability

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Highlights of [GAO-09-811](#), a report to the Committee on Homeland Security and Governmental Affairs, U.S. Senate

## Why GAO Did This Study

In the wake of the 2005 Gulf Coast Hurricanes, coordination and collaboration challenges created obstacles during the government's response and recovery efforts.

Because of the many stakeholders involved in recovery, including all levels of government, it is critical to build collaborative relationships. Building on GAO's September 2008 report which provided several key recovery practices from past catastrophic disasters, this report presents examples of how federal, state, and local governments have effectively collaborated in the past.

GAO reviewed five catastrophic disasters—the Loma Prieta earthquake (California, 1989), Hurricane Andrew (Florida, 1992), the Northridge earthquake (California, 1994), the Kobe earthquake (Japan, 1995), and the Grand Forks/Red River flood (North Dakota and Minnesota, 1997)—to identify recovery lessons. GAO interviewed officials involved in the recovery from these disasters and experts on disaster recovery. GAO also reviewed relevant legislation, policies, and the disaster recovery literature.

## What GAO Recommends

GAO recommends the Secretary of Homeland Security direct the Federal Emergency Management Agency (FEMA) to create a mechanism focused on sharing information and lessons learned regarding disaster recovery, including good collaborative practices. The Department of Homeland Security concurred with our recommendation.

View [GAO-09-811](#) or [key components](#). For more information, contact Stanley J. Czerwinski at (202) 512-6808 or [CzerwinskiS@gao.gov](mailto:CzerwinskiS@gao.gov).

## DISASTER RECOVERY

### Experiences from Past Disasters Offer Insights for Effective Collaboration after Catastrophic Events

#### What GAO Found

Effective collaboration among stakeholders can play a key role in facilitating long-term recovery after a catastrophic event. Toward that end, GAO has identified four collaborative practices that may help communities rebuild from the Gulf Coast hurricanes as well as future catastrophic events:

- **Develop and communicate common goals to guide recovery.** Defining common recovery goals can enhance collaboration by helping stakeholders overcome differences in missions and cultures. After the Grand Forks/Red River flood, federally-funded consultants convened various stakeholders to develop recovery goals and priorities for the city of Grand Forks. The city used these goals as a basis to create a detailed recovery action plan that helped it to implement its recovery goals.
- **Leverage resources to facilitate recovery.** Collaborating groups bring different resources and capacities to the task at hand. After the Northridge earthquake, officials from the Federal Highway Administration and California's state transportation agency worked together to review highway rebuilding contracts, discuss changes, and then approve projects all in one location. This co-located, collaborative approach enabled the awarding of rebuilding contracts in 3 to 5 days—instead of the 26 to 40 weeks it could take using normal contracting procedures. This helped to restore damaged highways within a few months of the earthquake.
- **Use recovery plans to agree on roles and responsibilities.** Organizations can collectively agree on who will do what by identifying roles and responsibilities in recovery plans developed either before or after a disaster takes place. Learning from its experiences from the Loma Prieta earthquake, San Francisco Bay Area officials created a plan that clearly identifies roles for all participants in order to facilitate regional recovery in the event of a future disaster.
- **Monitor, evaluate, and report on progress made toward recovery.** After the 1995 earthquake, the city of Kobe and the surrounding region established processes to assess and report on recovery progress. These jurisdictions required periodic external reviews over 10 years on the progress made toward achieving recovery goals. As a result of one of these reviews, the city of Kobe gained insight into unintended consequences of how it relocated elderly earthquake victims, which subsequently led to a change in policy.

Past recovery experiences—including practices that promote effective collaboration—offer potentially valuable lessons for future catastrophic events. FEMA has taken some steps to facilitate the sharing of such experiences among communities involved in disaster recovery. However, the agency can do more to build on and systematize the sharing of this information so that recovery lessons are better captured and disseminated for use in the future.

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## Abbreviations

CalTrans	California Department of Transportation
CDBG	Community Development Block Grant
DHS	Department of Homeland Security
EDA	Economic Development Administration
ESF #14	Emergency Support Function #14
FEMA	Federal Emergency Management Agency
FHWA	Federal Highway Administration
HUD	Department of Housing and Urban Development
LLIS	Lessons Learned Information Sharing Web Site
SBA	Small Business Administration

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United States Government Accountability Office  
Washington, DC 20548

July 31, 2009

The Honorable Joseph I. Lieberman  
Chairman  
The Honorable Susan M. Collins  
Ranking Member  
Committee on Homeland Security and Governmental Affairs  
United States Senate

Successful recovery from catastrophic disasters requires a partnership involving federal, state, and local governments, as well as the nonprofit and private sectors. An extensive group of participants—both governmental and nongovernmental—were involved in recovery efforts after the 2005 Gulf Coast hurricanes.<sup>1</sup> Stakeholders included virtually all cabinet-level federal agencies, several Gulf Coast states, almost 600 local jurisdictions in Louisiana and Mississippi including municipalities, parishes, school and utility districts, and housing authorities as well as community groups and other nongovernmental organizations. In the wake of the 2005 Gulf Coast hurricanes, numerous reports have identified coordination and collaboration as a key challenge during the government’s response.<sup>2</sup> Our more recent work on Gulf Coast recovery efforts also identified collaboration and coordination as an obstacle to the recovery process as well.<sup>3</sup>

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<sup>1</sup>“The 2005 Gulf Coast hurricanes” refers to Hurricanes Katrina and Rita, which struck the Gulf Coast in August and September of 2005, respectively. For the purposes of this report, they are treated collectively as a single disaster event. When “the Gulf Coast hurricanes” is used, the term also includes Hurricanes Ike and Gustav, which struck the Gulf Coast in September 2008.

<sup>2</sup>U.S. Senate Committee on Homeland Security and Governmental Affairs, *Hurricane Katrina: A Nation Still Unprepared*, S. Rept. 109-322 (Washington, D.C.: May 2006); U.S. House of Representatives Select Bipartisan Committee to Investigate the Preparation for and Response to Hurricane Katrina, *A Failure of Initiative*, (Washington, D.C.: February 2006); White House Homeland Security Council, *The Federal Response to Hurricane Katrina: Lessons Learned*, (Washington, D.C.: February 2006); and GAO, *Catastrophic Disasters: Enhanced Leadership, Capabilities, and Accountability Controls Will Improve the Effectiveness of the Nation’s Preparedness, Response, and Recovery System*, [GAO-06-618](#) (Washington, D.C.: September 2006).

<sup>3</sup>For example, see GAO, *Disaster Recovery: FEMA’s Public Assistance Grant Program Experienced Challenges with Gulf Coast Rebuilding*, [GAO-09-129](#) (Washington, D.C.: December 2008).

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Experiences from past disasters can provide valuable insights to help communities overcome recovery challenges. At your request, last September we identified several key practices from past catastrophic disasters to help other communities when recovering from such events.<sup>4</sup> In that report, we described actions taken by state and local governments during past disasters that facilitated recovery. Specifically, localities (1) created a clear, implementable, and timely recovery plan; (2) built state and local capacity for recovery; (3) implemented strategies for business recovery; and (4) adopted a comprehensive approach to combat fraud, waste, and abuse. Taken together, these actions provide state and local officials with a set of tools and approaches to consider when recovering from a catastrophic event.

In this report, we focus on a key element involved in developing and carrying out many of these practices—collaboration. Because of the numerous partners and stakeholders involved after a disaster, effective collaboration is critical in order to accomplish many recovery-related tasks. As agreed with your offices, this report (1) presents examples of how federal, state, and local governments have collaborated in the past, identifying selected practices that may be helpful for communities recovering from the Gulf Coast hurricanes as well as future catastrophic events and (2) describes ways in which the Federal Emergency Management Agency (FEMA) supports collaboration among recovery stakeholders and the extent to which it facilitates the sharing of lessons and experiences from past recovery efforts.

To conduct our review, we selected five catastrophic disasters: the 1989 Loma Prieta earthquake in northern California; Hurricane Andrew, which struck southern Florida in 1992; the 1994 Northridge earthquake in Los Angeles, California; the 1995 Kobe earthquake in Japan; and the 1997 Grand Forks/Red River flood in Grand Forks, North Dakota, and East Grand Forks, Minnesota. We visited four of these communities to meet with federal, state, and local officials and make observations of the conditions today. Although we did not visit communities affected by the Grand Forks/Red River flood, we were able to gather the necessary

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<sup>4</sup>GAO, *Disaster Recovery: Past Experiences Offer Insights for Recovering from Hurricanes Ike and Gustav and Other Recent Natural Disasters*, GAO-08-1120 (Washington, D.C.: September 2008). The Federal Emergency Management Agency classifies an event where related federal costs reach or exceed \$500 million as “catastrophic.” Under this definition, all the past disasters we reviewed qualify as catastrophic.

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information through telephone interviews with key officials involved in the recovery as well as experts knowledgeable about the disaster. Further, we also obtained and reviewed relevant legislation, ordinances, policies, and program documents that describe steps taken to facilitate long-term recovery following each of our selected disasters.

We interviewed officials at the Department of Homeland Security (DHS), FEMA, the Economic Development Administration (EDA) in the Department of Commerce, the Department of Housing and Urban Development (HUD), nongovernmental organizations, as well as academic experts who were knowledgeable about the recovery following each of our selected disasters and issues relating to coordination. To understand how FEMA supports collaboration among recovery stakeholders and the extent to which it facilitates the sharing of experiences from past recovery efforts, we interviewed FEMA staff and gained access to some of its online systems. For more information on our scope and methodology see appendix I. For detailed descriptions of the impact of the five disasters we reviewed as well as selected recovery strategies taken in the wake of each of these events, see appendix II to VI.

We conducted this performance audit from June 2007 through July 2009 in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.

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## Background

State and local governments generally have the primary responsibility for disaster recovery while the federal government provides support when requested. Because there are many parties involved in this process—including all levels of government as well as victims and businesses within the affected communities—effective collaboration is a key factor for successful recovery. In addition, collaboration among recovery stakeholders can continue for an extended period of time. Short-term recovery is immediate and an extension of the response phase in which



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basic services are restored.<sup>5</sup> Long-term recovery can include some of these short-term activities, but typically continues them for a number of months or years, depending on the severity and extent of the damage sustained.<sup>6</sup> It also involves restoration of both individuals and the community, including the redevelopment of damaged areas.

To provide recovery assistance after a disaster, many federal agencies and program components are called upon to administer disaster supplemental programs and funding, re-program funds, or expedite normal procedures. For example, grants, loans, loan guarantees, temporary housing, and counseling are among the forms of disaster assistance available from federal agencies including FEMA; the departments of Agriculture, Commerce, HUD, Treasury, and Transportation; and the Small Business Administration (SBA).

Some of these federal programs provide financial resources to state and local governments following disasters, while others provide technical assistance. For example, FEMA's Public Assistance grant program provides funding to repair or replace public infrastructure; HUD's Community Development Block Grant (CDBG) program provides formula grants for long-term recovery needs such as rehabilitating and building housing, EDA's economic adjustment grant responds to the short- and long-term effects of severe economic dislocation events on communities; and DHS's Flood Insurance Program enables individuals to purchase insurance against losses from physical damage from floods. Other agencies directly carry out rebuilding or recovery projects such as the reconstruction of levees by the U.S. Army Corps of Engineers and the repair of federal roads by the Federal Highway Administration. Federal recovery assistance is also provided directly to disaster victims. For example, FEMA's Individual Households Program provides housing, financial assistance, and other direct services while the Internal Revenue

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<sup>5</sup>Short-term recovery includes actions such as providing essential public health and safety services, restoring interrupted utility and other essential services, reestablishing transportation routes, and providing food and shelter for those displaced by the incident. Although called short-term, some of these activities may last for weeks.

<sup>6</sup>Some examples of long-term recovery include providing permanent disaster-resistant housing units to replace those destroyed, initiating a low-interest façade loan program for the portion of the downtown area that sustained damage from the disaster, and initiating a buyout of flood-prone properties and designating them community open space.

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Service provides information about how to claim casualty loss deductions.<sup>7</sup>

The federal government also provides technical assistance for communities to engage in long-term community recovery activities, through the Emergency Support Function #14 (ESF #14), as part of the National Response Framework.<sup>8</sup> ESF #14 coordinates federal and state long-term community recovery support and helps communities plan for and identify the necessary resources for recovery. Developed shortly before the 2005 Gulf Coast hurricanes, ESF #14 was not in place at the time of the five past disasters we studied. ESF #14 and FEMA's Long-Term Community Recovery Branch in its Disaster Assistance Directorate, which supports this annex, provide assistance in coordinating federal, state, and local recovery efforts and developing community recovery plans. The Long-Term Community Recovery Branch also works with other federal agencies to help identify program gaps and the potential need for flexibilities and new authorities during the recovery process.

Our previous work defines collaboration broadly as any joint activity that is intended to provide more public value than could be produced when the organizations act alone. Because of the large number and wide variety of stakeholders involved in the recovery from a catastrophic event, collaboration is a critical element of this process. We have previously reported that agencies can enhance and sustain their collaborative efforts by engaging in eight practices: defining and articulating a common outcome; establishing mutually reinforcing or joint strategies; identifying and addressing needs by leveraging resources; agreeing on roles and responsibilities; establishing compatible policies, procedures, and other means to operate across agency boundaries; developing mechanisms to monitor, evaluate, and report on results; reinforcing agency accountability for collaborative efforts through agency plans and reports; and reinforcing

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<sup>7</sup>Federal agencies and types of federal assistance differ from disaster to disaster. As such, not all the federal agencies we discuss are appropriated funds to provide assistance in all domestic disasters.

<sup>8</sup>The Department of Homeland Security's National Response Framework, issued in final form in January 2008, is a guide for how the federal, state, local, and tribal governments, along with nongovernmental and private sector entities, will collectively respond to and recover from all disasters regardless of their cause. The framework recognized the need for collaboration among the myriad of entities and personnel involved in response efforts at all levels of government, nonprofit organizations, and the private sector. While the Emergency Support Function #14 is included in this guide, the National Response Framework indicates that long-term community recovery is outside its scope.

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individual accountability for collaborative efforts through performance management systems.<sup>9</sup>

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## Effective Collaboration Has Facilitated Recovery in Past Disasters

Effective collaboration among recovery stakeholders can play a key role in facilitating disaster recovery. Because the recovery process requires partnerships among representatives from all levels of government as well as nongovernmental groups, effective collaboration is critical. We have previously identified a number of practices that can enhance and sustain collaborative efforts, which would help to facilitate disaster recovery.<sup>10</sup> We found four of these collaborative practices in the past disasters we reviewed. Specifically, governments (1) developed and communicated common recovery goals; (2) leveraged resources to facilitate recovery; (3) used recovery plans to agree on roles and responsibilities; and (4) evaluated and reported on progress made toward recovery.

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## Develop and Communicate Common Recovery Goals

To overcome significant differences in missions, cultures, and established ways of doing business, collaborating groups must have a clear and compelling rationale for working together. We have previously reported that the compelling rationale for collaboration can be imposed externally such as through legislation or can come from the understanding that there are benefits to working together. In either case, collaborative efforts require staff working across organizational lines to define and articulate a common outcome or purpose they are seeking to achieve that is consistent with respective organizational goals and mission.<sup>11</sup> In our September 2008 report on disaster recovery, we discussed the importance of recovery plans and how clearly identified goals in such plans can provide direction and specific objectives for communities to focus on.<sup>12</sup> Building on this, we identify two approaches of how stakeholders involved in the recovery process following the Kobe earthquake in Japan and the Grand Forks/Red River flood in Grand Forks, North Dakota, worked collectively to define and articulate common outcomes.

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<sup>9</sup>GAO, *Results Oriented Government: Practices That Can Help Enhance and Sustain Collaboration among Federal Agencies*, [GAO-06-15](#) (Washington, D.C.: October 2005).

<sup>10</sup>[GAO-06-15](#).

<sup>11</sup>[GAO-06-15](#).

<sup>12</sup>[GAO-08-1120](#).

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A month after the 1995 Kobe earthquake, the national Japanese government formed a “reconstruction committee” to organize recovery efforts. The Japanese government created this body through national legislation that required the participation of numerous national, prefectural,<sup>13</sup> and local agencies as well as nongovernmental organizations, such as the Kobe Chamber of Commerce and Industry. The Prime Minister personally managed the committee, and the Chief Cabinet Secretary and Minister of the National Land Agency served as deputy managers. The reconstruction committee also included representation from other high-ranking government officials—including cabinet ministers, the governor of Hyogo prefecture, and the mayor of the city of Kobe—as well as participants from academia. According to an official who participated in this committee, the involvement of these prominent leaders not only encouraged stakeholders involved in the reconstruction committee to collaborate in order to come to agreement on recovery goals, it brought national attention to recovery issues.

Working together through this committee, these officials and stakeholders collaborated to create a national plan of action for recovery. This plan included broad proposals that provided insight for how the national government would assist in recovery, such as recommending that a long-term recovery plan be developed quickly as well as making housing reconstruction, debris removal, port reconstruction, and job creation a national priority. It also included more specific details to guide Hyogo prefecture and the city of Kobe’s recovery, such as promptly demolishing unsound structures and using excess concrete from the earthquake rubble for construction and repairs in the port area.

In addition to providing an action plan, this committee also reviewed Hyogo prefecture’s and the city of Kobe’s recovery plans to help localities align their recovery proposals with the funding priorities of the national government. According to an evaluation of the recovery conducted by the city as well as outside recovery experts, the specific feedback provided by the reconstruction committee, along with the recovery goals previously clarified by the national government helped local officials to come to consensus on their recovery goals. Within 6 months of the earthquake, Hyogo prefecture and the city of Kobe completed recovery plans, which included specific recovery goals for their regions, such as rebuilding

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<sup>13</sup>In the Japanese governmental system, a prefecture is an administrative district about the size of a county.

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damaged housing units in 3 years and completing physical recovery in 10 years. According to this evaluation, the delineation of these goals at a local level played a critical role in helping to coordinate the wide range of participants involved in implementing recovery projects.

After the Grand Forks/Red River flood in 1997, federal, state, and local officials worked together to define common goals when planning for the recovery of Grand Forks, North Dakota. Technical consultants, funded by a HUD grant, brought together federal and city officials as well as members of the community to discuss Grand Forks's rebuilding priorities. According to a local official, because the city had no experience with the process of developing common goals for the city prior to the flood, this external facilitation helped the Grand Forks community and city officials come to agreement on a set of common recovery goals. The recovery goals resulting from these meetings were included in a comprehensive recovery plan for Grand Forks. A subsequent city evaluation found that the process of specifying goals within the recovery plan—which identified five broad goals and a number of supporting objectives and tasks to achieve those goals—helped the city to conceive and formulate projects in coordination with the city council and representatives from state and local governments.

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## Leverage Resources to Facilitate Recovery

We have previously reported that to effectively collaborate requires the identification of the human and financial resources needed to initiate or sustain collaborative effort.<sup>14</sup> In doing so, collaborating groups can bring different levels of resources and capacities to the task at hand. In our September 2008 report, we discussed the importance of helping state and local governments take advantage of all available disaster assistance by enhancing their financial and technical capacity when needed.<sup>15</sup> Following the Kobe and Northridge earthquakes, we found examples of how governments leveraged the knowledge and expertise of diverse stakeholders to produce effective collaboration and, in turn, facilitate the recovery process.

In the wake of the 1995 Kobe earthquake, the Japanese government created a formal organization through which human capital resources from all levels of the government were leveraged to plan for and

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<sup>14</sup>GAO-06-15.

<sup>15</sup>GAO-08-1120.

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implement recovery strategies. A committee comprised of high ranking officials—including members of the Japanese House of Representatives and leaders of affected jurisdictions and their staff—developed intergovernmental recovery strategies. In addition to those high-ranking officials, the committee also included working-level staff from national ministries to provide expertise for developing specific details to be included in the recovery plan. For example, staff from the Ministry of Transportation brought expertise on infrastructure replacement while those from the Kobe Chamber of Commerce and Industry contributed knowledge regarding economic recovery matters. According to a Japanese official involved in the recovery, this committee combined the political know-how from the top-level officials and interdisciplinary expertise from line-level bureaucrats to propose many recovery proposals which laid a foundation for the national government’s approach to recovery. The Japanese government also leveraged human capital expertise through this committee to facilitate the implementation of recovery strategies. Upon the approval of certain recovery policies, working staff associated with the committee returned to their respective organizations to guide their home departments on how best to implement the strategies. A Japanese official involved in the committee said that this collaboration helped to ensure that disparate ministries understood and properly implemented the recovery strategies they helped to develop.

After the 1994 Northridge earthquake, the city of Los Angeles, California, also leveraged human capital resources to accelerate the rebuilding of its freeway system. Using the technical expertise of staff from the Federal Highway Administration (FHWA) and the California Department of Transportation (CalTrans), the city of Los Angeles developed an expedited contracting process. To review construction proposals more efficiently, FHWA and CalTrans staff collaborated to review documents, discuss needed changes, and then approve projects together in one location. According to CalTrans officials, state and federal offices normally conduct separate reviews. This joint process helped to expedite the approval of projects while still meeting oversight requirements for both levels of government. Under standard contracting procedures, the contracting process could take 26 to 40 weeks to complete. However, this collaborative, co-located process enabled state highway officials to advertise and award construction contracts in just 3 to 5 days. By leveraging the knowledge and resources of state and federal staff in this way, Los Angeles successfully restored its highways within a few months after the Northridge earthquake.

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In addition to leveraging human capital expertise, Los Angeles also found ways to take advantage of resources from different federal programs to facilitate housing recovery for certain disaster victims. The city faced challenges in helping owners of housing units that had suffered extensive damage in the earthquake. When Los Angeles learned that some of these dwellings were not eligible for SBA disaster assistance because they had negative cash flows, the city identified resources available from a HUD program to help these property owners. Using these funds, the city allocated \$322 million to an Earthquake Supplemental Disaster Relief fund which assisted property owners who were declined by SBA. To obtain information on owners who might benefit from this program, the city entered into a cooperative agreement with SBA to obtain direct referrals of individuals who were denied loans so that the city could inform them of this additional source of assistance. A city evaluation of this program found that Los Angeles received over 5,000 referrals, which represented more than 22,000 housing units.

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## Use Recovery Plans to Identify Roles and Responsibilities

Collaborating organizations can work together to define and agree on their respective roles and responsibilities. In doing so, they can collectively agree on who will do what, organize joint and individual efforts, and facilitate decision making.<sup>16</sup> One way to delineate roles and responsibilities for disasters is through planning. For the emergency response phase, the National Response Framework sets out the roles and responsibilities of key partners at the local, tribal, state, and federal levels. Responsibilities for recovery stakeholders are detailed in ESF #14, the Long-Term Recovery Annex. The annex mostly addresses the responsibilities of federal agencies involved in recovery.

Because state and local governments play a lead role in disaster recovery, it is also important for their roles and responsibilities to be clearly delineated. After past disasters, this information has been delineated through long-term community recovery plans. Communities can develop such plans either before or after a disaster occurs. Post-disaster recovery plans typically include detailed projects and approaches to rebuild a community based on the damage and impacts of the specific disasters. Some communities have supplemented post-disaster plans by conducting planning efforts prior to a disaster.

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<sup>16</sup>GAO-06-15.

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Pre-disaster planning does not involve actually developing rebuilding programs in advance of a disaster because the patterns of damage from natural disasters are impossible to predict with sufficient accuracy to support detailed pre-planning. However, these plans can be helpful in other ways that foster collaboration, specifically in defining the roles and responsibilities of recovery stakeholders prior to a disaster. We have previously reported how effective recovery plans identify specific roles and responsibilities among various stakeholders.<sup>17</sup> While these plans are often developed after a disaster takes place, we have identified some instances where this information was clarified beforehand.

Los Angeles's Recovery and Reconstruction Plan clearly identified the roles and responsibilities of key officials involved in recovery. In the aftermath of the Northridge earthquake in southern California, the city revised the plan for the purposes of recovery from that event. Specifically, the plan identified which city departments have responsibility for implementing pre-determined activities before and after a disaster in several functional categories, including residential, commercial, industrial rehabilitation, and economic recovery. An evaluation of the plan funded by the National Science Foundation found that the assignment of general responsibilities to the departments was useful because it helped the various components of city government to understand their post-disaster roles and responsibilities. Further, the process of developing the plan also improved collaboration among stakeholders. Specifically, representatives from many departments—including public safety, planning, public works, building, and community redevelopment—met several times to develop and revise the plan.

A good plan is not simply a paper-driven exercise, but rather the result of a dynamic and inclusive process wherein key stakeholders are consulted and involved in the identification of priorities and the formation of strategies. Collaboration among recovery stakeholders was further enhanced through long-term recovery planning exercises held by the city of Los Angeles. In these exercises, police and fire officials engaged in role playing exercises in which they assumed the responsibilities of recovery officials. For example, a public safety officer played the role of a building inspector responsible for issuing building permits after an earthquake. A city official at the time of the earthquake told us that the process of developing the plan and conducting exercises was an important part of

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<sup>17</sup>[GAO-08-1120](#).



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developing relationships among stakeholders which facilitated collaboration among city officials after the Northridge earthquake. According to a federally-funded evaluation of this plan, the contacts established during the planning process facilitated the recovery after the Northridge earthquake. Another city official stated a positive outcome of the planning effort was that participants knew of others who worked on similar issues with whom they can initiate conversations. In addition, the process of preparing and testing the plan educated city staff on their post-disaster roles and responsibilities.

More recently, two other communities have taken action to develop recovery plans prior to a disaster that identify roles and responsibilities for recovery. In the San Francisco Bay Area, state and local governments used pre-disaster planning to reinforce a regional approach to recovery as well as to assign regional roles and responsibilities for recovery. Learning from past experiences with natural disasters in California including the Loma Prieta earthquake, the Bay Area recognized the value of planning for recovery in anticipation of future disasters. Toward that end, Bay Area officials initiated a regional disaster response planning effort in 2004 culminating with the Regional Emergency Coordination Plan in March 2008, which included a subsidiary plan focused specifically on recovery.<sup>18</sup>

Specifically for recovery, the San Francisco Bay Area Regional Emergency Coordination Plan summarizes in a table organizations involved at each level of government and the primary role of each.<sup>19</sup> For example, the table specifies that local governments will resume government functions and request state and federal assistance, that state agencies will implement state-funded recovery programs, and that regional infrastructure owners will initiate planning for and implementation of permanent repairs. We have previously reported on the challenges that state and local jurisdictions sometimes face with understanding the extent to which the

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<sup>18</sup> Governor's Office of Emergency Services, *San Francisco Bay Area Regional Emergency Coordination Plan RECP Recovery Subsidiary Plan*, (San Francisco, Calif. March 2008), <http://www.oes.ca.gov/WebPage/oeswebsite.nsf/Content/F39818FB706ECED68825743D00738C6A?OpenDocument>, accessed on July 29, 2009.

<sup>19</sup> According to an official involved in the development of the Regional Emergency Coordination Plan, Bay Area state and local governments used \$2.5 million in funds from the Department of Homeland Security's Urban Area Security Initiative Grant (typically used for preparedness and response activities) to develop its pre-disaster recovery plan.

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federal government will pay for disaster-related costs.<sup>20</sup> Pre-disaster recovery plans that clearly identify the roles and responsibilities of various stakeholders may prove useful in clarifying the specific types of costs federal programs are likely to cover as well as some of the requirements of these programs before a disaster strikes.

Partly as a result of experiences following Hurricane Andrew, Florida's Palm Beach County developed the Palm Beach Countywide Post-Disaster Redevelopment Plan for guiding decision making and action during the disaster period as well as detailing actions that can be taken before a disaster strikes to speed the recovery process.<sup>21</sup> Palm Beach County delineates roles and responsibilities for recovery by creating working groups who will be responsible for implementing different sections of the plan, including infrastructure, economic development, and government operations. Each working group is assigned several issues to cover along with a chairperson to spearhead those activities for the county. Additionally, city departments and agencies are represented in each of these working groups.

As an outgrowth of this plan, a Business and Industry program was created that formally integrated business interests into the recovery process. Additionally, the program also created a private-public partnership comprising local, state, regional, and national businesses as well as governmental and nongovernmental organizations. According to a Palm Beach County official, partners in this program are fully engaged in the development and implementation of recovery initiatives. These collaboration efforts have resulted in improved relationships among the governmental, nongovernmental, and business entities involved in the program.

Post-disaster recovery plans can also provide a vehicle to designate roles and responsibilities for recovery, among other things. We have previously reported that well-crafted post-disaster recovery plans can clarify roles and responsibilities and help jurisdictions make progress with recovery.<sup>22</sup>

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<sup>20</sup>GAO, *Gulf Coast Rebuilding: Observations on Federal Financial Implications*, [GAO-07-1079T](#) (Washington, D.C.: Aug. 2, 2007) and [GAO-09-129](#).

<sup>21</sup>Palm Beach County Division of Emergency Management, *Countywide Post-Disaster Redevelopment Plan, Palm Beach County, Florida*, (West Palm Beach, FL: August 2006), [http://www.pbcgov.com/publicsafety/emergencymanagement/resources/pdf/pdrp\\_AUG\\_06.pdf](http://www.pbcgov.com/publicsafety/emergencymanagement/resources/pdf/pdrp_AUG_06.pdf), accessed on July 29, 2009.

<sup>22</sup>[GAO-08-1120](#).

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For example, the city of Grand Forks’s recovery plan developed in the wake of the 1997 Grand Forks/Red River flood clearly identified which personnel—drawn from city, state, and federal agencies—would be needed to carry out each task. Specifically, the plan called for collaboration of staff from the city’s urban development and engineering/building inspection departments, FEMA, and the U.S. Army Corps of Engineers to create an inventory of substantially damaged buildings in the downtown area. By clarifying the roles and responsibilities of those who would be involved in accomplishing specific tasks, the plan provided detailed information to facilitate its implementation.

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## Monitor, Evaluate, and Report Progress Made toward Recovery

Organizations engaged in collaborative efforts need to create the means to monitor and evaluate their efforts to enable them to identify areas for improvement. Reporting on these activities can help decision makers, clients, and stakeholders obtain feedback for improving both policy and operational effectiveness.<sup>23</sup> We have previously reported that effective recovery plans identify clear goals that can provide governments with a basis for subsequent evaluations of the recovery progress.<sup>24</sup> As a next step, we identify how local jurisdictions impacted by the Kobe earthquake established a process through which government officials, community members, and recovery experts worked together to assess the recovery progress and recommend improvements.

Hyogo prefecture and the city of Kobe established a system of periodic recovery assessments in the wake of the 1995 Kobe earthquake in Japan. Both governments designed a two-phase approach to evaluating the progress they have made toward recovery, the first taking place about 5 years after the earthquake and the second about 10 years afterward. This design allowed for both a short- and long-term assessment of the recovery. Although the Hyogo and Kobe governments funded these evaluations, neither prefecture nor city employees were directly involved in conducting these assessments; rather, they used external staff to perform the reviews. Hyogo prefecture invited domestic and international disaster recovery experts to serve on its evaluation panels, while the city of Kobe staffed its reviews with members of local community groups.

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<sup>23</sup> [GAO-06-15](#).

<sup>24</sup> [GAO-08-1120](#).

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These evaluations focused on the goals established in the recovery plans approved by the national government 6 months after the earthquake. They enabled policy makers to measure the progress made by various stakeholders in achieving recovery goals, and identify needed changes to existing policies, and learned lessons for future disasters. The panels examined six broad recovery topics—including health, industry, employment, and urban development—which resulted in many recommendations to improve recovery from the Kobe earthquake.

For example, as a result of its 10-year evaluation Hyogo prefecture gained insight into the unintended consequences of how it relocated elderly earthquake victims, which subsequently led to a change in policy. After the earthquake, the prefecture gave priority to the relocation of elderly victims and grouped them together in special care residences located outside the city. While this policy ensured that this vulnerable population received housing quickly, it also had the unintended effect of isolating the relocated seniors, who were removed from their communities. In fact, the verification committee attributed this housing arrangement as leading to untimely deaths for some seniors. After learning of this finding, the prefecture built new types of residential housing that offer comprehensive lifestyle support for seniors. In addition, for future disasters the prefecture plans to develop a system to track displaced populations as they move from temporary to permanent housing to help maintain better contact with victims.

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## FEMA Has Taken Steps to Facilitate Collaboration among Stakeholders, but Could Do More to Share Recovery Experiences

Recovery experiences from past catastrophes—including good collaboration practices—can offer lessons for such events in the future. FEMA has taken some actions to encourage recovery stakeholders to collaborate by sharing lessons and experiences related to recovery. However, in contrast to other phases of a disaster for which FEMA has a specific mechanism dedicated to sharing such information, this is not the case with the recovery phase.

**FEMA has taken steps to support collaboration through planning and sharing recovery lessons.** FEMA has assisted state and local governments in developing post-disaster recovery plans in various ways, which in turn can help facilitate collaboration among stakeholders. First, FEMA, along with other federal agencies such as HUD and EDA, provided technical assistance for post-disaster recovery plans for several of the disasters we reviewed. Second, FEMA developed guidance for conducting the long-term recovery planning process. More specifically, the agency created a Long-Term Community Recovery Self Help Guide that

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offers communities step-by-step guidance for implementing a recovery program and planning process. Third, FEMA created the Long-Term Recovery Assessment Tool to help communities analyze the impacts of a disaster while taking into consideration the local government's capacity to assist in promoting its own long-term recovery. The assessment tool helps federal and other decision makers identify the type and level of supplemental long-term community recovery assistance that may be needed for full recovery from a disaster. The tool also includes processes and procedures for assessing long-term recovery needs, community evaluation protocols, standard planning templates, staffing strategies, and timetables for various levels of effort.

FEMA has also taken actions to encourage collaboration among state and local officials to share experiences and expertise related to disaster recovery. For example, FEMA's Long-Term Community Recovery Branch, working through ESF #14, hosted a teleconference linking officials in Florida, Mississippi, Colorado, and Iowa with experience recovering from previous disasters to provide information to officials in Texas recovering from Hurricane Ike. In this way, officials with direct experience in the recovery process were able to share good practices related to recovery planning, disaster funds administration, and coordinating regional efforts with the participants from Texas. According to FEMA officials, this collaboration helped the Texas officials identify recovery projects and develop a community recovery plan. In addition, FEMA is considering ways to further facilitate the sharing of lessons learned for disaster recovery, including creating a peer-to-peer mentoring program where experienced local officials can provide technical assistance, advice, and support to communities impacted by the 2005 Gulf Coast hurricanes. However, these officials told us that this idea is still at an early stage and additional specifics are not yet available.

**FEMA's information sharing Web sites do not include a focus on recovery.** FEMA has systematic approaches for sharing lessons regarding three of the four phases of a disaster—preparedness, response, and mitigation; however, as of June 2009, the agency does not have an information sharing system focused on recovery. Officials involved in the preparedness and response phases of a disaster can share lessons through FEMA's Lessons Learned Information Sharing (LLIS) Web site. LLIS is a national online network of lessons learned and best practices for the emergency preparedness, response, and homeland security communities. Online since April 2004, LLIS provides users access to over 12,000 documents including state and local plans, after-action reports, best practices, and lessons learned that are culled from real-world experiences

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and exercises. Because the Web site includes some sensitive information, its registration process is limited to domestic users with “a need to know.”<sup>25</sup> Information on LLIS is organized through a number of “featured topics,” such as critical infrastructure, exercise planning and program management, and wild-land fires. Materials are also organized by numerous “disciplines” that have an emergency management focus such as emergency communications, mass care and human services, mortuary services, as well as search and rescue.

While LLIS does contain materials relating to recovery, the issue is neither a featured topic nor a discipline, making it challenging to access recovery-related information in an easy or intuitive way. Additionally, the message boards that allow LLIS users to discuss a variety of homeland security topics are rarely used to exchange information about recovery. For example, while almost 600 messages have been exchanged on forums discussing preparedness and response issues as of June 2009, only two messages have been posted to the message board focused on disaster recovery (and they were both from the same individual). A FEMA official with responsibility for LLIS told us that there is an increasing recognition that recovery is an underserved area of disaster management, and the agency can see benefits of potentially including more information about recovery in LLIS.

To share lessons related to the mitigation phase, FEMA has created a searchable online portfolio of case studies and best practices submitted by individuals and communities describing the measures they have taken to reduce the loss of life or property from future disasters. Communities that have taken creative steps in implementing good mitigation practices can submit those stories to FEMA where officials will review and possibly include them in the online best practices portfolio.

Unlike the information sharing mechanisms it has in place for the preparedness, response, and mitigation phases of a disaster, FEMA does not have a similar approach for sharing lessons focused on recovery. Recovery lessons from specific disasters are sometimes available through

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<sup>25</sup>For example, according to the Lessons Learned Information Sharing (LLIS) system project manager, applications from individuals with a “.gov” or “.us” Email address are approved immediately. However, applications from other types of Email addresses need to be affiliated with a recognized domestic organization and demonstrate a “need to know” in order to obtain access to LLIS. According to a FEMA official, the agency is working to provide limited LLIS access to international members.

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the FEMA Web site under the listings for specific disasters, although the amount and nature of recovery information available this way varies greatly. In addition, the Long-Term Community Recovery and ESF #14 Web site contains considerable information on recovery, but this site is mostly dedicated to providing technical guidance for planning and does not permit recovery officials to share lessons or learn about recovery best practices. FEMA officials told us that they plan to develop a document compiling community-based best practices for disaster recovery, but they do not know when it will be available.

Perhaps more useful than the sharing of reports and other written accounts of recovery lessons and experiences is the ability to directly network with other recovery officials who can answer questions and relate insights first-hand. In the course of our work, we learned of instances where this type of personal connection was particularly valuable. For example, a Watsonville, California, official told us of his efforts immediately after the Loma Prieta earthquake to contact a local official in southern California because he had read that the official had experienced an earthquake a few years earlier and he wanted to solicit his guidance. The official from southern California agreed to help and traveled to Watsonville the next day to share his experiences and provide insights on potential recovery strategies. In another example, when Hurricane Katrina hit the Gulf Coast in 2005, officials from Grand Forks, North Dakota, offered to help city leaders in Biloxi, Mississippi, based on their experiences with the 1997 Grand Forks/Red River flood.

Through one-on-one exchanges like these, state and local officials involved in recovery can obtain tailored advice from individuals who have addressed similar challenges themselves. For emergency managers involved in the disaster preparedness and response phases, FEMA's LLIS Web site has a network-building feature that can be used to foster this type of exchange. LLIS provides its users with access to a directory of other registered users that can be searched for a number of variables including name, affiliation, and emergency management function (primarily disciplines such as mass care and human services or public health). The online directory mostly consists of officials and researchers involved in various aspects of emergency management.<sup>26</sup> Such a directory, or one similar to it, might be very useful to recovery officials seeking to network

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<sup>26</sup>As of July 2009, LLIS had over 51,000 active registered members.

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with, and learn from, others with experiences or expertise in disaster recovery.

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## Conclusions

Collaboration is essential for an effective partnership between the wide range of participants involved in the disaster recovery process. While effective collaboration has helped to facilitate recovery in past disasters, experiences from the 2005 Gulf Coast hurricanes reveal that more can be done in this area. Specifically, we have identified a number of practices used during past disasters that can offer insights for effective collaboration: developing and communicating common goals to guide recovery; leveraging resources to facilitate recovery; using recovery plans to agree on roles and responsibilities; and monitoring, evaluating, and reporting on progress made toward recovery. While there is no one right way for how jurisdictions should manage recovery nor is there a recipe of techniques that fits all situations, the examples we describe in this report—which were tailored to the specific needs and conditions of those particular disasters—may provide insights into improving collaboration among the many stakeholders involved in the ongoing recovery efforts in the Gulf Coast as well as for future catastrophic events.

Recovery stakeholders have a responsibility for fostering collaboration during disaster recovery. State and local governments have taken the lead in defining roles and responsibilities within pre- and post-disaster recovery plans, a step that has helped to facilitate the recovery process. The federal government has also played an important role in fostering collaboration for recovery. For example, FEMA has supported post-disaster planning efforts and hosted videoconferences between experienced officials and those currently in the recovery process. However, the agency can take additional steps to share information focused on recovery so that it is captured and preserved for the future. In the absence of a mechanism for compiling and disseminating recovery information, valuable expertise from officials who have first-hand recovery knowledge may be lost.

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## Recommendation for Executive Action

To improve the ability of the federal government to capture and disseminate recovery information, we recommend that the Secretary of Homeland Security direct the Administrator of FEMA to establish a mechanism for sharing information and best practices focused on disaster recovery, including practices that promote effective collaboration such as those discussed in this report. Options for doing this could include (1) creating an approach, similar to the LLIS Web site or the mitigation best practices portfolio, through which disaster recovery lessons can be



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compiled and shared, and personal networks among interested recovery officials encouraged; and/or (2) modifying the LLIS Web site to add a focus on recovery by taking steps such as including more recovery documents, creating a recovery topic area within LLIS, and creating an online directory for recovery officials to encourage networking and facilitate further sharing of recovery experiences.

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## Agency Comments

On June 19, 2009, we provided a draft of this report to the Secretary of Homeland Security for comment. We received written comments on July 22, 2009. In its written comments, which are reprinted in appendix VII, DHS concurred with our recommendation. In addition, the department provided technical clarifications that we incorporated where appropriate. We also provided drafts of relevant sections to public officials, nongovernmental stakeholders, and recovery experts involved in or knowledgeable of the specific examples cited in this report and incorporated their comments as appropriate.

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As agreed with your offices, unless you publicly announce the contents of this report earlier, we plan no further distribution until 30 days from the date of this letter. We will then send copies of this report to the Secretaries of Homeland Security and Housing and Urban Development, the FEMA Administrator, the Assistant Secretary of Commerce for Economic Development, and the state and local officials we contacted for this review. In addition, the report will be available on our Web site at <http://www.gao.gov>.

If you or your staff have any questions regarding this report, please contact me at (202) 512-6806 or by email at [CzerwinskiS@gao.gov](mailto:CzerwinskiS@gao.gov). Contact points for our Offices of Congressional Relations and Public Affairs may be found on the last page of this report. GAO staff who made major contributions to this report are listed in appendix VIII.



Stanley J. Czerwinski  
Director  
Strategic Issues

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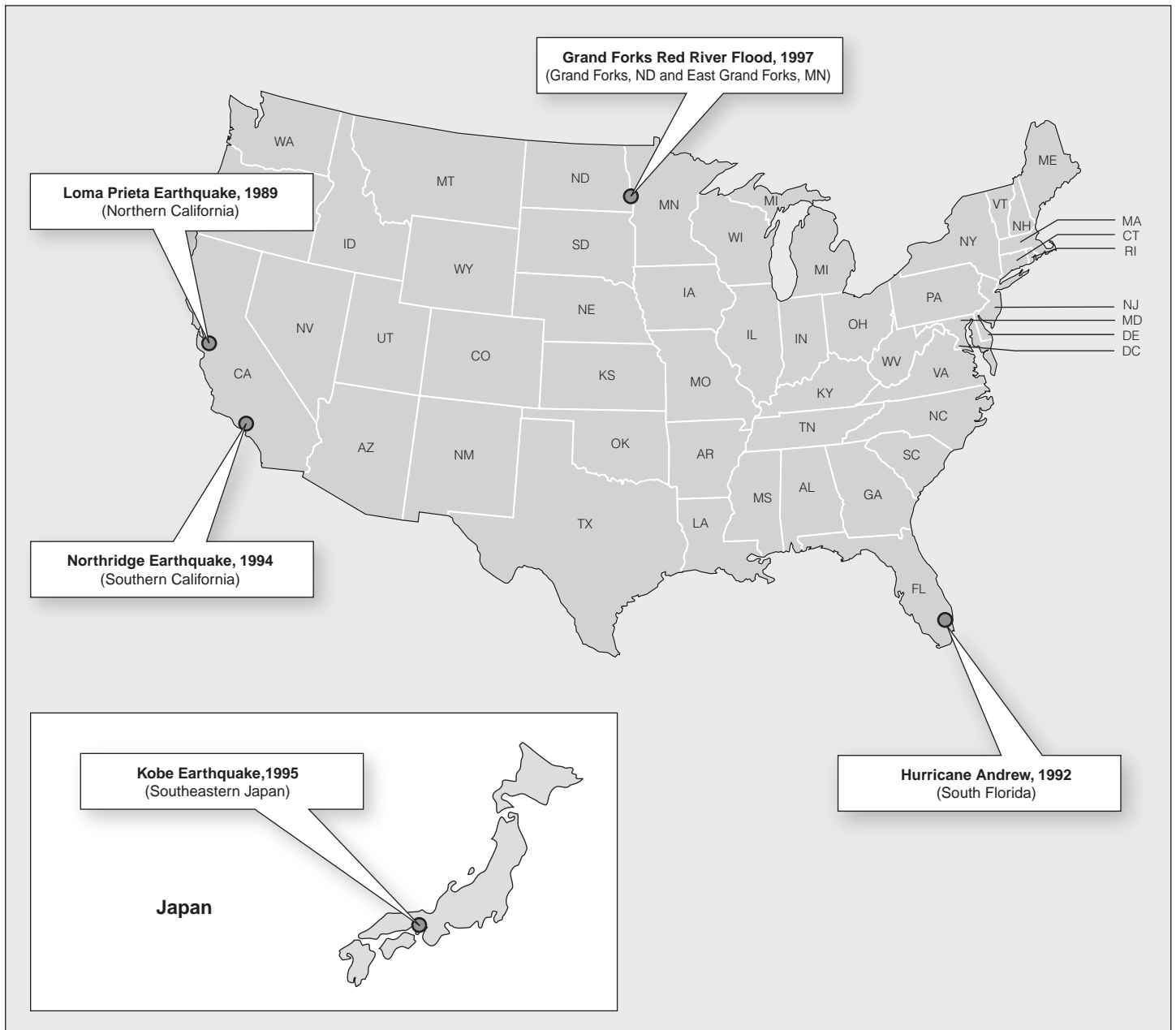
# Appendix I: Scope and Methodology

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To identify recovery lessons from past experiences, we selected 5 catastrophic disasters: the 1989 Loma Prieta earthquake, Hurricane Andrew in 1992, the 1994 Northridge earthquake, the 1995 Great Hanshin-Awaji (Kobe) earthquake, and the 1997 Grand Forks/Red River flood to review (see fig. 1). The Federal Emergency Management Agency (FEMA) defines a “catastrophic” event as one where the related federal costs reach or exceed \$500 million. Under this definition, all the disasters selected for this review qualify as catastrophic. We chose these disasters because they had devastating communitywide or regional impact and occurred in urban areas of developed nations. Additionally, these disasters occurred far enough in the past that we could observe the long-term recovery process, occurred recently enough so that key officials and supporting documentation are still available, and represent different types of natural disasters.

We interviewed officials from national, state, and local governments and nongovernmental organizations, as well as academic experts, involved in or knowledgeable of the recovery following each of our selected disasters. We also obtained and reviewed legislation, ordinances, policies, and program documents that described steps that were taken to facilitate long-term recovery following each of these disasters as well as the disaster recovery literature. In some instances, our review was limited by the availability of historic documents and the accessibility of key officials engaged in recovery from past disasters. To better understand the federal government’s role in recovery from these disasters, we interviewed officials at the Department of Homeland Security, FEMA, the Economic Development Administration in the Department of Commerce, and the Department of Housing and Urban Development.

Figure 1: Five Disasters Included in this Review (1989–1997)



Source: GAO; Art Explosion (map).

We visited the key communities impacted by four of the five disasters in our study to meet officials involved in the recovery effort and examine current conditions. Although we did not visit communities affected by the 1997 Grand Forks/Red River flood, we were able to gather the necessary information through telephone interviews with key officials involved in the recovery as well as recovery experts knowledgeable about the disaster. The scope of our work did not include independent evaluation or verification regarding the extent to which the communities' recovery efforts were successful and the practices we discuss in this report only represent a selection of the many recovery actions taken after these disasters.

To identify examples of good collaboration among recovery stakeholders, we applied eight key practices we have reported on in prior work that enhance and sustain collaboration: (1) define and articulate a common outcome; (2) establish mutually reinforcing or joint strategies; (3) identify and address needs by leveraging resources; (4) agree on roles and responsibilities; (5) establish compatible policies, procedures, and other means to operate across agency boundaries; (6) develop mechanisms to monitor, evaluate, and report on results; (7) reinforce agency accountability for collaborative efforts through agency plans and reports; and (8) reinforce individual accountability for collaborative efforts through performance management systems.<sup>1</sup> We used this framework to assess the ways in which recovery stakeholders collaborated in the five disasters included in our review. While we found examples related to four of these good collaborative practices, others that enhance coordination may also exist.<sup>2</sup>

To understand how FEMA supports collaboration among recovery stakeholders and the extent to which it facilitates the sharing of lessons and experiences from past recovery efforts, we interviewed officials from FEMA's Long-Term Community Recovery Branch and staff responsible for managing the agency's Lessons Learned Information Sharing (LLIS) Web site. We also obtained access to LLIS and FEMA's online mitigation best

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<sup>1</sup>GAO, *Results Oriented Government: Practices That Can Help Enhance and Sustain Collaboration among Federal Agencies*, [GAO-06-15](#) (Washington, D.C.: October 2005).

<sup>2</sup>GAO has previously reported on regional coordination in the context of emergency preparedness, see GAO, *Homeland Security: Effective Regional Coordination Can Enhance Emergency Preparedness*, [GAO-04-1009](#) (Washington, D.C.: September 2004).

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practices portfolio, after which we reviewed the content and operations of those systems.

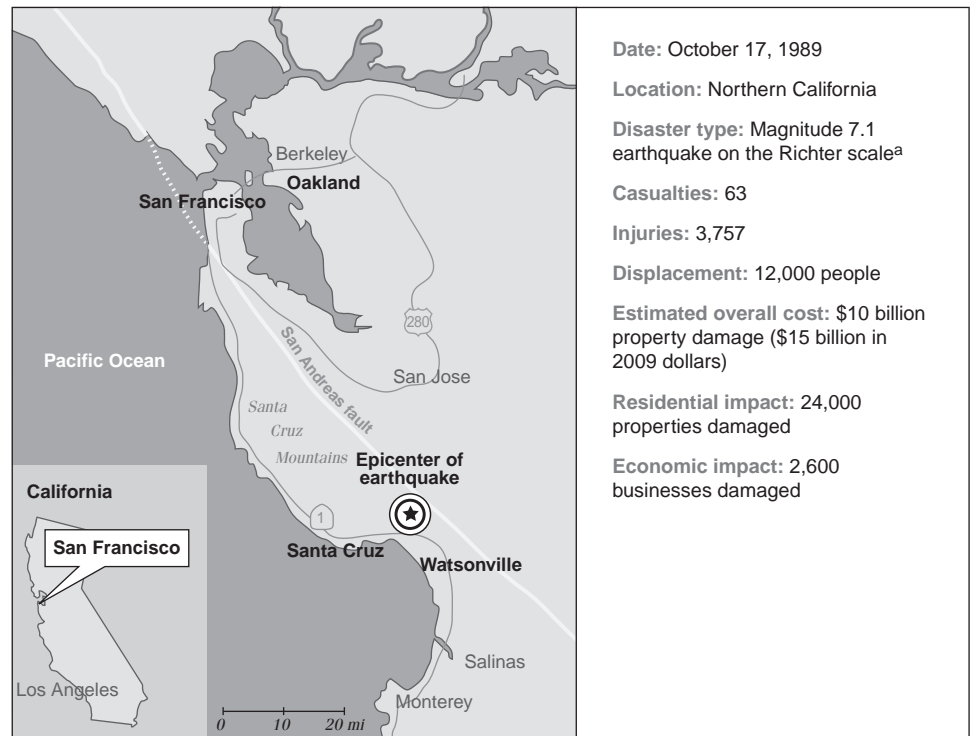
We conducted this performance audit from June 2007 through July 2009 in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.

# Appendix II: Loma Prieta Earthquake

## Disaster Impacts

The Loma Prieta earthquake, which occurred in the Santa Cruz mountains in 1989, severely impacted four cities in northern California. San Francisco experienced damage to several areas, including its Embarcadero freeway, Marina district, and City Hall. In Oakland, the earthquake caused the collapse of the Cypress Expressway as well as damage to other infrastructure and low income housing. The cities of Santa Cruz and Watsonville, both located near the earthquake epicenter, suffered devastating destruction to their downtown districts (see fig. 2).

**Figure 2: Selected Facts about the Impact of the Loma Prieta Earthquake**



Sources: GAO presentation of information from the National Academy of Sciences, U.S. Geological Survey, Earthquake Engineering Research Institute, and GAO/RCED-96-136.

<sup>a</sup>According to the U.S. Geological Survey, an earthquake registering magnitude 6.3 on the Richter scale is considered to be "strong."

## Long-term Recovery Snapshot

The federal government provided significant funding to the affected areas to facilitate its recovery from the 1989 Loma Prieta earthquake. Some examples of federal assistance for recovery are shown in figure 3.

**Figure 3: Examples of Federal Assistance for Recovery from the Loma Prieta Earthquake**

Congressional supplemental appropriation	Assistance from selected federal agencies
<p>\$3.2 billion for 1989 domestic disasters (\$5 billion in 2009 dollars)</p> <p><i>Public Laws 101-130 (Oct. 26, 1989) and 103-211 (Feb. 12, 1994)</i></p>	<ul style="list-style-type: none"> <li>• Federal Emergency Management Agency Public Assistance grants: \$514 million for permanent work projects (\$816 million in 2009 dollars)</li> <li>• Department of Housing Community Development Block Grants: none</li> <li>• Commerce Economic Development Administration grants: \$7 million for 8 projects (\$11 million in 2009 dollars)</li> </ul>

Sources: Presentation of GAO analysis of Appropriation Acts, GAO/RCED-92-141, and data from the Economic Development Administration.

The areas most impacted by the earthquake were Oakland, San Francisco, and other cities in Santa Cruz county, including Santa Cruz,<sup>1</sup> and Watsonville.<sup>2</sup> Key aspects of disaster recovery include planning, housing, economic development, and infrastructure. The following presents an overview of selected recovery efforts after the Loma Prieta earthquake in each of these areas. However, it does not provide a comprehensive account of recovery actions taken.

## Planning

Two months following the earthquake, the Santa Cruz City Council appointed a citizen group to develop an overall plan to rebuild the devastated downtown area. Santa Cruz faced the challenge of reaching consensus for decisions regarding recovery. The city facilitated decision making during the recovery from the Loma Prieta earthquake as a result of growing tension between citizens and local officials. To do so, the city

<sup>1</sup>The major industries in the city of Santa Cruz, located about 74 miles south of San Francisco, include agriculture, tourism, manufacturing, food processing, and high-tech firms. The population in 1990 was approximately 49,000.

<sup>2</sup>Watsonville is located about 20 miles from Santa Cruz and close to the epicenter of the Loma Prieta earthquake. Agriculture and food processing are the main industries in Watsonville. The population in 1990 was approximately 31,000.

devised a formal structure that incorporated time frames that helped different community groups reach consensus on a unified recovery plan. It created Vision Santa Cruz, a 36-member citizen advisory body that included wide representation from the neighborhood and community groups, business, finance, labor, and nonprofit organizations. To facilitate decision making among these groups, according to a former Santa Cruz official, time limits were instituted so that if Vision Santa Cruz did not agree on a plan by a certain date, city officials would finalize the plan without the group's consensus. Further, once a consensus was reached on an issue, it could not be opened for discussion again. Although faced with the challenge of uniting political groups with differing views in the community, Vision Santa Cruz succeeded in bringing the community together by forging a compromise among different stakeholders for recovery. Vision Santa Cruz completed the Downtown Recovery Plan in September 1991, which provided the policies, standards, and guidelines to direct the downtown rebuilding.

The Downtown Recovery Plan provided guidance for building form, character, and height; housing; accessibility; open space and streetscape; circulation; and parking. According to a former Santa Cruz official, the Downtown Recovery Plan took into account the needs of the retail community by redesigning the business center. For example, the plan proposed new design guidelines that made buildings more suitable for retail purposes, such as requiring large ground floor windows to ensure that stores received more lighting. Specifically, the main street was designed to accommodate both pedestrians and low speed traffic (as opposed to being pedestrian-only), preserved on-street parking, and widened sidewalks. This plan is still in use today to guide development projects in downtown Santa Cruz.

Watsonville relied on planning assistance offered by the Urban Land Institute to create a redevelopment plan. The city followed the plan it developed to rebuild and revitalize its downtown with a specific focus on implementation and an ancillary focus on development potential, planning, urban design, development goals, and marketing strategies. Watsonville



took the opportunity to make improvements to address changing demographics of many blocks that became empty as a result of the earthquake. However, not all aspects of the plan were successfully implemented. For example, one of the plan's goals was to support and reopen a department store. However, because the store's upscale retail marketing did not fit with the changing demographics, sales dropped, and the store closed within one year.

The Urban Land Institute also offered planning assistance to the city of Santa Cruz; however, the final plan focused heavily on housing, which was not the direction in which the city was interested. Therefore, the city of Santa Cruz did not implement the plan. According to a former Santa Cruz official, a key finding of the Urban Land Institute was the need to establish a decision-making process to overcome the differing political and business interests in the community. Toward that end, the city established Vision Santa Cruz which helped to facilitate the planning process for the city's downtown recovery.

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## Housing

Approximately 850 housing units in Watsonville (almost 10 percent of the city's housing stock) were severely damaged or destroyed after the Loma Prieta earthquake. According to a report funded by the Federal Emergency Management Agency, Watsonville planners drafted a rebuilding ordinance within the first four days after the earthquake that suspended the limits on rebuilding nonconforming construction. The ordinance also streamlined the permitting process. Santa Cruz County, which includes the city of Watsonville, passed a temporary one-half-cent sales tax increase for 6 years, called Measure E. The proceeds were targeted to damaged areas within the county based on an allocation approved by voters. Watsonville received approximately \$15 million through Measure E which helped to repair the damaged housing. Further, Watsonville also used portions of existing Department of Housing and Urban Development's Community Development Block Grant funds that it received prior to the earthquake (and not part of a supplemental or special disaster appropriation) to repair and replace damaged housing units. Within 1 year of the earthquake, almost 50 percent of the damaged housing units in Watsonville were repaired or replaced.

The Loma Prieta earthquake resulted in the loss of many single-room occupancy units in the cities of Oakland and Santa Cruz. Oakland experienced destruction or severe damage of 1,300 single-room occupancy units, which provided housing to many minority and elderly residents. Oakland financed the replacement of single-room occupancy units through

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California's Disaster Assistance Program. In Santa Cruz, single-room occupancy units were built in several new buildings. According to a subsequent evaluation of the earthquake, these buildings represented an overall improvement in the housing stock.

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## Economic Development

The cities of Watsonville and Santa Cruz adopted strategies for economic development after the Loma Prieta earthquake. Watsonville, which suffered about \$60 million in damage (or equal to 350 percent of its general fund annual budget prior to the earthquake) had the highest per capita loss of any impacted city. To help restore its damaged downtown, Watsonville built a new parking garage with retail space on the first floor, improved the façades of rebuilt or refurbished buildings, helped to secure federal funding for restoration of a local department store, and constructed a performing arts center to replace a damaged high school auditorium.

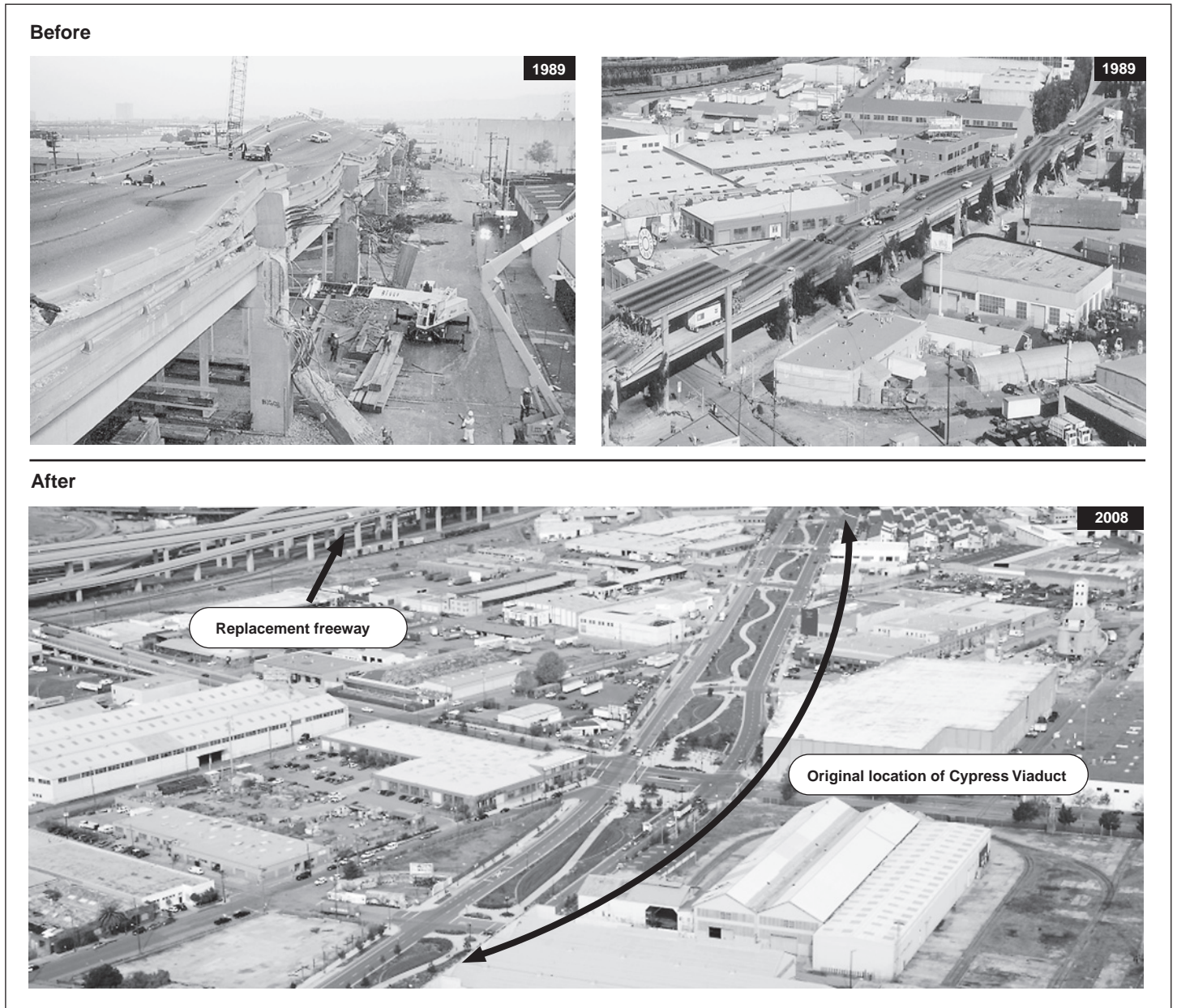
Santa Cruz, which lost approximately 20 percent of its sales tax due to earthquake damage, worked with community groups to construct seven large aluminum and fabric pavilions where local businesses that suffered physical damage temporarily relocated. Santa Cruz also constructed a parking garage with retail space on the first floor, and a nine-screen cinema complex that brings 750,000 people a year downtown, benefiting many other businesses because of the increased foot traffic. As a result of these strategies, a lively and youthful atmosphere in the downtown currently exists.

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## Infrastructure

The Loma Prieta earthquake damaged several major transportation structures in the San Francisco Bay Area, including the Embarcadero Freeway and the Cypress Expressway. The California Department of Transportation (CalTrans) worked with the Federal Highway Administration (FHWA) to finance the replacement of the Cypress Expressway with a cost sharing ratio of 90 percent of the funding from the federal government and 10 percent from the state. However, construction did not begin until 1994 partly because of community opposition to rebuilding the expressway in its original location, which divided a neighborhood in West Oakland. To address community concerns, CalTrans and FHWA moved the expressway so that it runs along the edge of the residential area. The space previously taken by the expressway is now occupied by new businesses, housing, and parks. See figure 4 for images of the Cypress Expressway before and after the replacement project.

Figure 4: The Cypress Expressway Suffered Extensive Damage from the 1989 Earthquake (top); Oakland Moved the Expressway to Reconnect a Neighborhood that Had Been Previously Divided (bottom)



Sources: Photographs courtesy of the California Department of Transportation, District 4, Oakland, Calif. Photographer: Bob Colin (top right and top left). Photographer: William R. Hall (bottom).

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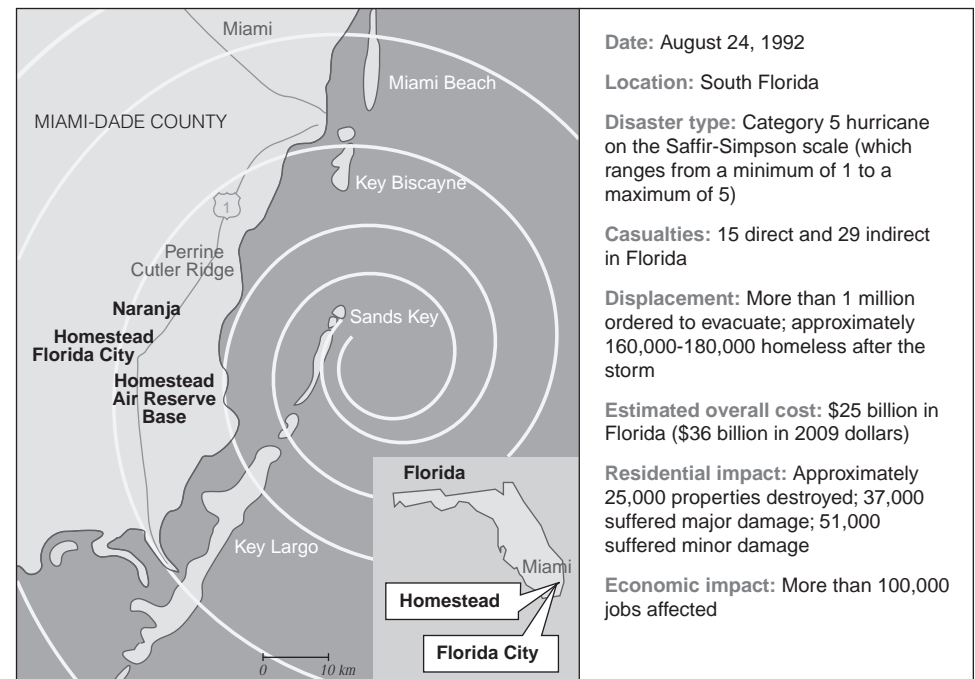
In San Francisco, the controversial decision to demolish the Embarcadero Freeway caused business owners to worry that the lack of a freeway would negatively impact travel to the waterfront. Today, the Embarcadero Freeway has been replaced with an above-ground park that connects the city to the waterfront. Other affected jurisdictions in Northern California also experienced significant infrastructure damage. For example, Watsonville's sewer system was heavily damaged as a result of uneven ground settlement, which took more than 5 years to repair.

# Appendix III: Hurricane Andrew

## Disaster Impacts

Hurricane Andrew made landfall over southern Miami-Dade County in Florida as a category 5 hurricane, severely impacting several cities in southern Florida, including Homestead and Florida City (see fig. 5). As a result of the hurricane, the city of Homestead suffered a 31 percent decline to its population, 60 percent of the aggregated residential property value, and 29 percent of its average commercial real estate value. Additionally, the Department of Defense's decision to scale down the presence of the Homestead Air Force Base contributed to the loss of thousands of jobs. In Florida City, located near Homestead, Hurricane Andrew damaged every building, reducing residential property value by 78 percent, and the average commercial real estate value by 32 percent.

**Figure 5: Selected Facts about the Impact of Hurricane Andrew**



Sources: GAO presentation of information from the National Oceanic and Atmospheric Administration, the Economic Development Administration, the International Hurricane Center, and GAO/RCED-93-186.

## Long-term Recovery Snapshot

The federal government provided significant funding to the affected area to facilitate its recovery from Hurricane Andrew in 1992. Some examples of federal assistance for recovery are shown in figure 6.

**Figure 6: Examples of Federal Assistance for Recovery from Hurricane Andrew**

Congressional supplemental appropriation	Assistance from selected federal agencies
<p>\$6.2 billion for natural disasters including Hurricane Andrew (\$9 billion in 2009 dollars)</p> <p><i>Public Laws 102-368 (Sept. 23, 1992) and 103-50 (July 2, 1993)</i></p>	<ul style="list-style-type: none"> <li>• Federal Emergency Management Agency Public Assistance grants: \$822 (\$1.2 billion in 2009 dollars) with \$245 million for permanent work projects (\$355 billion in 2009 dollars)</li> <li>• Department of Housing Community Development Block Grants: \$85 million (\$123 million in 2009 dollars); also includes funds for Hurricane Iniki and Typhoon Omar</li> <li>• Commerce Economic Development Administration grants: \$50.9 million for 28 projects (\$73 million in 2009 dollars)</li> </ul>

Sources: Presentation of GAO analysis of Appropriation Acts as well as data from the Federal Emergency Management Agency and the Department of Commerce Office of Inspector General.

Key aspects of disaster recovery include planning, housing, economic development, and infrastructure. The following presents an overview of selected recovery efforts after Hurricane Andrew in each of these areas. However, it does not provide a comprehensive account of recovery actions taken.

## Planning

To help plan for the recovery from Hurricane Andrew, community leaders created a nonprofit organization called We Will Rebuild. The organization was led by the publisher of the Miami-Herald as well as other political, business, and civic leaders in Miami-Dade County. A key role that We Will Rebuild played was to coordinate the distribution of nearly \$28 million of private and public funds. We Will Rebuild worked to devise recovery strategies through 29 committees that focused on different issue areas, including agriculture, business and economic development, housing, social services, as well as families and children. Committee members developed plans to achieve goals within those areas and in some instances implemented those strategies directly. For example, to achieve the goal of preventing the complete closure of the Homestead Air Force Base, one committee successfully advocated for the base to be changed into a combined civil and military facility.

We Will Rebuild also funded planning meetings, coordinated through local universities, which brought together as many as 300 professionals over a 3 week period to create solutions for rebuilding Miami-Dade County. Teams comprised of architects, engineers, planners, and as well as others from the public and private sectors presented proposals for how to rebuild

communities and neighborhoods. Eventually these meetings produced 16 projects focused on many issues such as site-specific neighborhood revitalization plans focused on urban planning, transportation, historic preservation, and natural resources for 28 communities in the county. Many of these plans served as the basis for the redevelopment of neighborhoods and future regional developments related to water management, transportation development, and the preservation of buildings and open space.

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## Housing

Hurricane Andrew caused devastating housing damage in Miami-Dade County, resulting in the destruction of over 25,000 homes and major damage to over 37,000 homes. According to a city official, Florida City worked with the Department of Housing and Urban Development to create a program that provided second mortgages for homeowners to repair damaged housing. Today, the population of Florida City is approximately 10,000, a significant increase from the 3,000 still remaining in the wake of the hurricane.

Over 8,000 Homestead residents, or 31 percent of its pre-hurricane population, left the city, leaving many abandoned properties that created challenges for the city to redevelop some areas. Some residential communities that suffered significant damage from the hurricane were eventually rebuilt. For example, the Naranja Lakes development, a private condominium community of thousands of residents, was razed and is being rebuilt with a mix of condominium and single family homes.

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## Economic Development

To rebuild the economy in the wake of Hurricane Andrew, a number of economic development organizations in Miami-Dade County worked to revitalize affected communities. One of these groups, the Economic Development Council was founded by local business leaders in response to Hurricane Andrew to represent the economic development interests of the unincorporated portions of Miami-Dade County. The group led efforts to beautify a major roadway and commercial center through the area. The Economic Development Council hoped that such improvement projects would attract residents who had moved away after the hurricane to return to the county once more.

The mission of the Vision Council, another organization that promoted economic redevelopment after Hurricane Andrew, was to attract new businesses to Miami-Dade County. The council serves Homestead, Florida City, and other parts of southern Miami-Dade County. The Vision Council

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experienced mixed success in its economic development efforts. For example, the Vision Council assisted Homestead's efforts to market and build a 270 acre commerce park, called Park of Commerce. The Vision Council also supported the creation of the Homestead-Miami Speedway, which sponsors professional car racing events year round. However, not all of its projects have been successful. For example, we observed that the Park of Commerce which the Vision Council supported was mostly vacant today. A Vision Council official explained that factors such as the perceived risk of another storm in the area, high insurance rates, and population decline has deterred some businesses from relocating to Miami-Dade County.

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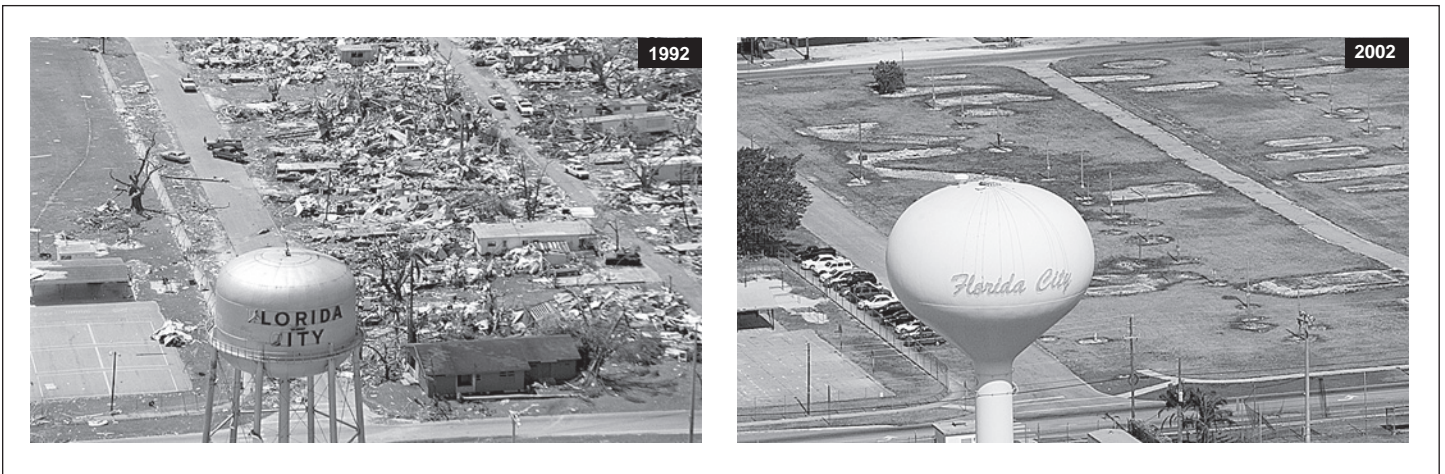
## Infrastructure

Hurricane Andrew destroyed much of the public and transportation infrastructure in southern Florida. For example, Florida City lost every public building to Hurricane Andrew, according to a city official. The city rebuilt the government center complex, which included the city hall, jail, and police station. Because the city's public funds were insufficient to rebuild the new government center complex, it used funding from the Economic Development Administration (EDA) in the Department of Commerce and the state to complete the center.

Homestead and Florida City suffered sustained damage to their water systems. In Homestead, EDA provided \$7.7 million partly for the construction of water and sewer lines, which extended these services to the Miami-Homestead Speedway and Park of Commerce facilities. Without those infrastructure enhancements, these projects could not have been developed. Florida City also sustained extensive damage to its water delivery system. EDA provided almost \$5 million for the repair, replacement, and expansion the city's water system (see fig. 7). As a result of the water system's expansion, the State Farmers Market was also restored, creating almost 400 jobs.



Figure 7: Florida City's Water Distribution System Was Heavily Damaged



Sources: Lou Toman, Sun Sentinel (left); Carl Seibert, Sun Sentinel (right).

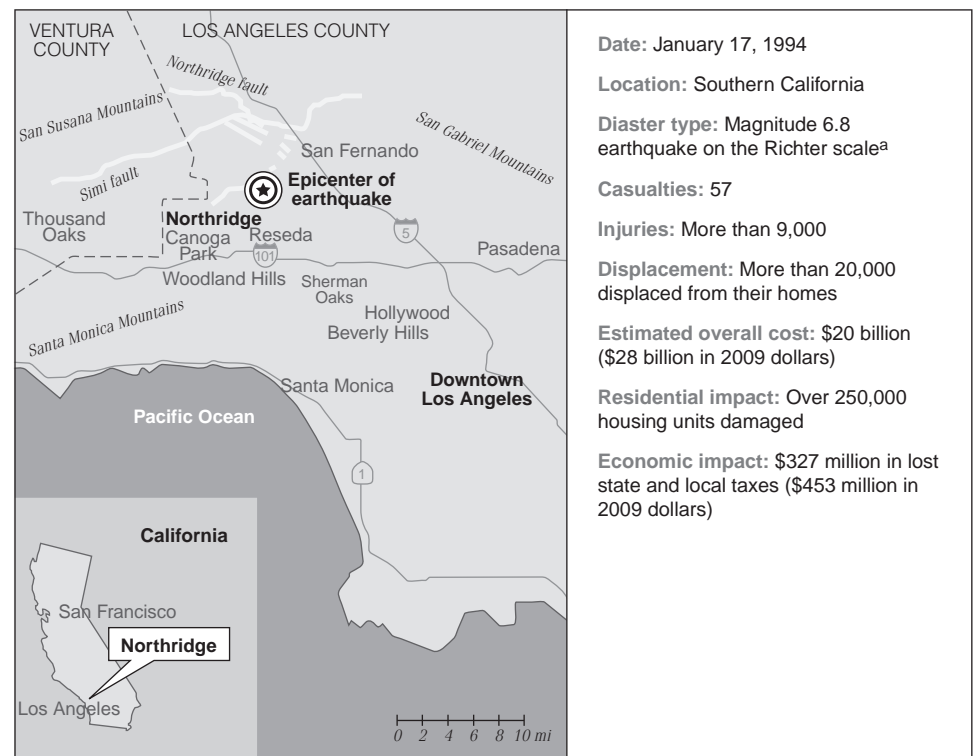
Miami-Dade County also used its recovery efforts from the hurricane to improve its transportation infrastructure. A local leader explained that the departure of some county residents following Hurricane Andrew resulted in the widespread dispersion of employees and employers. For example, the lack of transportation impacted the ability of the construction industry to find adequate labor, increasing both operating costs and stifling competition. To provide access to employment for individuals who work in the county, the Federal Emergency Management Agency provided at least \$38 million to increase transportation services to the county.

# Appendix IV: Northridge Earthquake

## Disaster Impacts

The epicenter of the 1994 Northridge earthquake was located in western Los Angeles county, causing significant physical and economic damage (see fig. 8). The earthquake devastated damaged southern California’s freeway system, including the collapse of 11 overpasses on some of the busiest freeways in Los Angeles. The earthquake also caused widespread residential damage throughout many neighborhoods in the San Fernando Valley and other pockets in central and south central Los Angeles. Until the domestic terrorist attacks in 2001, the Federal Emergency Management Agency spent more money on the response to, and recovery from, Northridge than any previous disaster.

**Figure 8: Selected Facts about the Impact of the Northridge Earthquake**



Sources: GAO presentation of information from the U.S. Geological Survey, the city of Los Angeles, and GAO/RCED-94-193.

<sup>a</sup>According to the U.S. Geological Survey, an earthquake registering magnitude 6.3 on the Richter scale is considered to be “strong.”

## Long-term Recovery Snapshot

The federal government provided significant funding to the affected area to facilitate its recovery from the 1994 Northridge earthquake. Some examples of federal assistance for recovery are shown in figure 9.

**Figure 9: Examples of Federal Assistance for Recovery from the Northridge Earthquake**

Congressional supplemental appropriation	Assistance from selected federal agencies
<p>\$8.7 billion for the Northridge earthquake and other disasters (\$12 billion in 2009 dollars)</p> <p><i>Public Laws 103-211 (Feb. 12, 1994), 103-317 (Aug. 26, 1994), and 103-327 (Sept. 28, 1994)</i></p>	<ul style="list-style-type: none"> <li>• Federal Emergency Management Public Assistance grants: \$4.4 billion (\$8 billion in 2009 dollars), of that amount, \$3.9 billion was spent on permanent work projects</li> <li>• Department of Housing Community Development Block Grants: \$725 million (\$1 billion in 2009 dollars)</li> <li>• Commerce Economic Development Administration grants: \$85 million for 21 projects (\$117 million in 2009 dollars)</li> </ul>

Sources: Presentation of GAO analysis of Appropriation Acts, GAO summary of documents from the city of Grand Forks, N.D., and data from the Federal Emergency Management Agency and the Economic Development Administration.

Key aspects of disaster recovery include planning, housing, economic development, and infrastructure. The following presents an overview of selected recovery efforts after the Northridge earthquake in each of these areas. However, it does not provide a comprehensive account of recovery actions taken.

## Planning

In 1987, prior to the Northridge earthquake, the city of Los Angeles developed a Recovery and Reconstruction Plan in preparation for a future disaster. In the aftermath of the Northridge earthquake, the city adapted this plan to guide its recovery efforts. According to an evaluation funded by the National Science Foundation, the plan contributed to fostering good working relations between city officials and other stakeholders. The process of developing the plan itself strengthened relationships between city departments and agencies which in turn helped to facilitate collaboration during the recovery process. City departments also implemented several strategies outlined in the plan, such as developing loan programs for businesses unable to receive Small Business Administration loans, establishing an interdepartmental group to adapt the recovery plan for Northridge, streamlining permit processing, establishing mutual aid agreements, and forming reconstruction task forces.

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## Housing

After the earthquake, the city of Los Angeles designated 17 areas that suffered extensive damage as “ghost towns,” to received priority attention. The vacating of 7,500 housing units in those areas resulted in criminal trespassers such as drug dealers, prostitution rings, and squatters. In turn, those activities increased burglaries in surrounding neighborhoods and resulted in local businesses losing their customer base. The city’s housing department collaborated with the police, public works, and building departments to create a special work unit to focus on security and offer refinancing to help property owners in the ghost towns rebuild. A subsequent evaluation of the housing reconstruction after Northridge found that this program contributed to the successful rebuilding of those areas and helped to stabilize surrounding neighborhoods.

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## Economic Development

The city of Los Angeles implemented different strategies to assist businesses that were impacted by the earthquake. According to city officials, the Los Angeles used the Department of Housing and Urban Development’s (HUD) Community Development Block Grant (CDBG) to create a \$24 million commercial recovery loan program that included a grace period for loan repayment so to provide businesses with a window of time to get reestablished after the disaster. The city also used grants from the Economic Development Administration (EDA) in the Department of Commerce to develop projects that created new jobs. For example, an EDA grant funded the construction of a biomedical facility for research and development at California State University at Northridge that resulted in the creation of 1,600 new jobs. Further, the city helped to fund an outreach and counseling program developed by a local nonprofit to provide direct technical assistance to affected businesses in the San Fernando Valley. Specifically, the nonprofit provided guidance to businesses on obtaining federal and local governmental financial assistance, as well as strategies for adjusting to changes in the business environment.

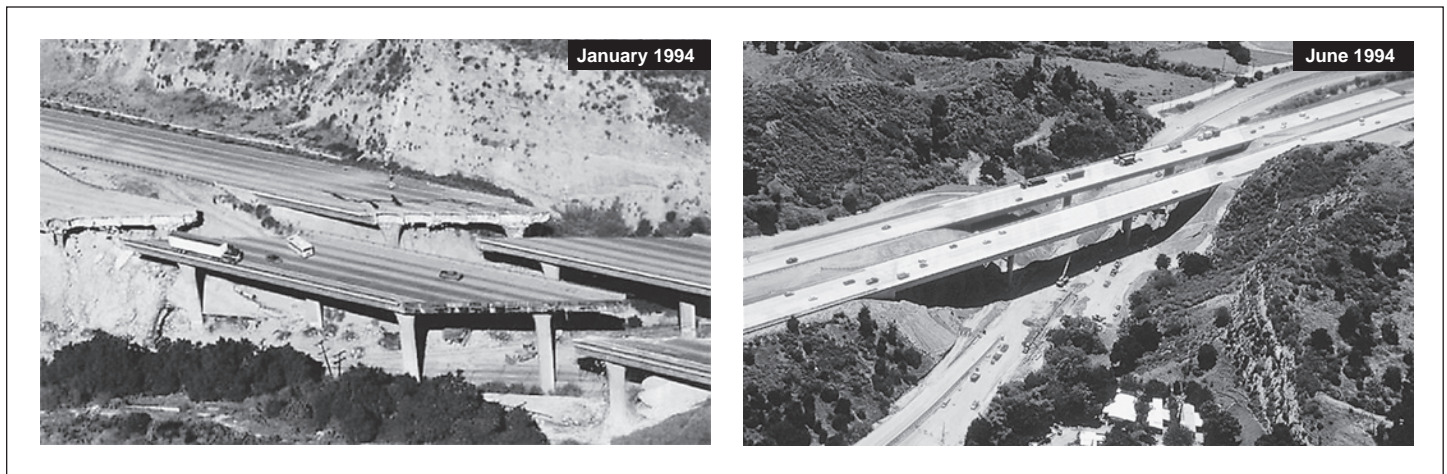
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## Infrastructure

According to Los Angeles officials, the city prioritized the replacement and restoration of its highway infrastructure to restore the region’s transportation networks. To maintain partial traffic flows immediately after the earthquake, the city established alternative detour routing for the highways. The earthquake resulted in 480 damage locations to federal, state, and local roads throughout the Los Angeles area and forced the closure of four major highway corridors that, together, carried over 780,000 vehicles per day before the earthquake. This caused significant disruption to commuting patterns as well as the transportation of freight.

To expedite the completion of highway rebuilding projects, the California Department of Transportation (CalTrans) included financial incentives in its contracts for each major restoration or repair contract. Under this approach, bonuses were available to each contractor who completed projects early. CalTrans calculated bonuses based on an analysis of the economic cost incurred to the region as a result of the disruption to traffic and associated delays. As a result of this approach, bonuses were awarded to 9 out of the 10 eligible contractors. According to a CalTrans official, these incentives allowed the city to restore these freeways within a few months after the earthquake (see fig. 10).

**Figure 10: The Gavin Canyon Underpass, Part of Southern California’s Interstate 5, Suffered Severe Damage but Was Restored Within a Few Months**



Sources: U.S. Department of Transportation (left), California Department of Transportation (right).

The Federal Highway Administration also granted other measures of flexibility within its regulations to facilitate infrastructure recovery. For example, the agency granted exemptions from certain regulations, such as allowing the California Department of Transportation to proceed without conducting environmental impact statements as required under the National Environmental Policy Act.<sup>1</sup>

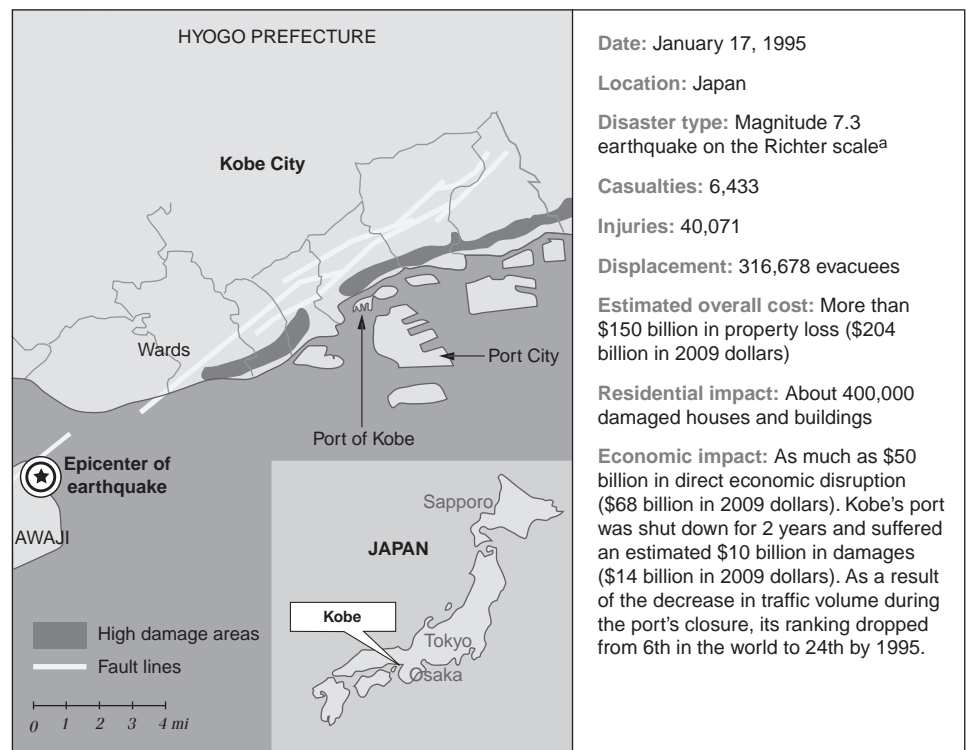
<sup>1</sup>GAO, *Los Angeles Earthquake: Opinions of Officials on Federal Impediments to Rebuilding*, [GAO/RCED-94-193](#) (Washington, D.C.: June 17, 1994).

# Appendix V: Kobe Earthquake

## Disaster Impacts

On January 17, 1995, a magnitude 7.3 earthquake caused significant damage to the Japanese city of Kobe in Hyogo prefecture.<sup>1</sup> As a result of the earthquake, the affected areas sustained heavy damage and many casualties. For example, over 6,000 people were killed and 40,000 injured. In addition to destroying over 400,000 homes and buildings, the earthquake caused extensive damage to roads, railroads, highways, and subway stations (see fig. 11). The port of Kobe, Japan's leading container shipping port at the time, also experienced heavy damage to almost all container berths.

**Figure 11: Selected Facts about the Impact of the Kobe Earthquake**



Sources: GAO presentation of information from the Japanese central government; Stephanie Chang, Ph.D.; David Edgington, Ph.D.; and Haruo Hayashi, Ph.D.

<sup>a</sup>According to the U.S. Geological Survey, an earthquake registering magnitude 6.3 on the Richter scale is considered to be "strong."

<sup>1</sup>In the Japanese governmental system, a prefecture is an administrative district about the size of a county.

## Long-term Recovery Snapshot

The Japanese government provided significant funding to facilitate recovery from the 1995 Kobe earthquake. Some examples of national government assistance for recovery are shown in figure 12.

**Figure 12: Examples of National Government Assistance for Recovery from the Kobe Earthquake**

- The central government allocated more than \$58 billion (\$79 billion in 2009 dollars) in first three years following earthquake to reconstruct basic infrastructure, housing, and other physical facilities.
- The central government helped Kobe City and Hyogo Prefecture establish a special loan fund of approximately \$9 billion (\$12 billion in 2009 dollars) repayable in 10 years, to support reconstruction activities not covered by other national programs.
- Special financial assistance legislation was created on March 1, 1995 to provide indirect individual assistance to small businesses, homeowners, and local public authorities.

Sources: GAO presentation of data from Laurie Johnson, Ph.D. and Professor Kenneth Topping.

Recovery after the Kobe earthquake was generally a top-down process of post-disaster planning and financing. The government prioritized the rapid rebuilding of infrastructure and economic stabilization and later focused on housing and social recovery. The physical reconstruction process took less than 3 years to complete. Specifically, the city of Kobe designated 24 areas to prioritize for rebuilding, using national government funds to widen roads, add parks and open spaces, and construct other public facilities. For the first 3 to 4 years after the earthquake, the focus was mainly focused on physical reconstruction. In subsequent years, the government shifted its focus to community development, economic development, and the restoration of communities. Key aspects of disaster recovery include planning, housing, economic development, and infrastructure. The following presents an overview of selected recovery efforts after the Kobe earthquake in each of these areas. However, it does not provide a comprehensive account of recovery actions taken.

## Planning

Immediately following the earthquake, Japan's national government implemented a 2-month moratorium where it did not approve any building permits so that the local governments could finalize planning before the rebuilding process began. Hyogo prefecture and the city of Kobe adopted complementary recovery plans within 2 months of the earthquake—in March 1995—which prioritized projects that replaced infrastructure as well as others that would help stabilize the economy and attract new businesses.

After the earthquake, there was a relatively short amount of time to submit proposals for the national budget in order to be considered for the coming year. To ensure that they could take advantage of national government funding as soon as possible, the city of Kobe and Hyogo prefecture completed its recovery plans promptly. Facing this deadline, local officials devised a two-phase strategy to develop a plan that could quickly identify broad recovery goals to provide a basis for budget requests to meet the national budget deadline. After that initial planning phase, the governments then collaborated with residents to develop detailed plans for specific communities.

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## Housing

The national government funded a 3-year emergency housing plan to build about 72,000 permanent new housing units throughout Kobe and Hyogo to replace an estimated 82,000 houses lost due to the earthquake. They planned to provide around 8,200 through the private rental market and more than half through public housing agencies. This overall target level was achieved by March 1998 when more than 120,000 new housing units were constructed. The accumulated number of new housing units built by 2005 was estimated to be over 222,000. Almost all the replacement housing was provided in multi-rise condominium structures, with approximately 56 percent of those available as public housing units. Both the public and private sector used a variety of strategies, aimed at many levels of the population, to ensure that replacement housing would be built. The result was that more housing was built than had been lost. According to an expert on Japan's recovery, the city of Kobe has recently experienced challenges in attracting new occupants—especially younger families—to move into these units.

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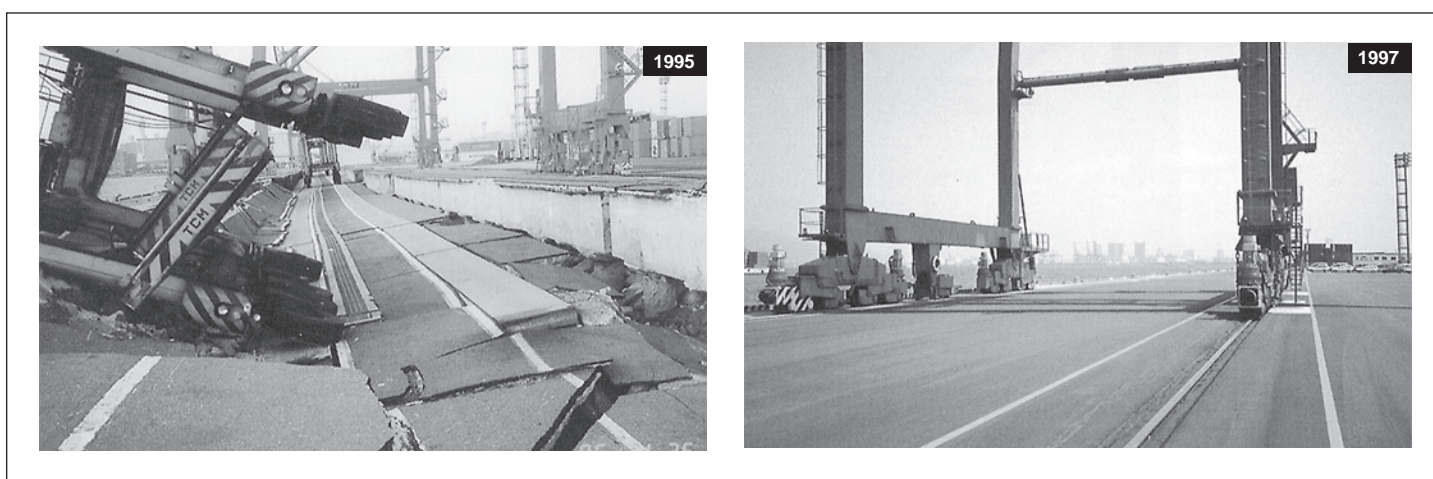
## Economic Development

The Kobe earthquake had lasting impacts on several industries, including the port and small businesses. The port of Kobe, Japan's leading container shipping port, sustained heavy damage to almost all container berths. Port repairs took almost 1 year to complete, during which time the port disruption was estimated to be an amount equivalent to the income of 40,000 workers. The city of Kobe completed its port restoration by March 1997 (see fig. 13). However, port activity stalled at around 80 percent of pre-earthquake levels. In October 1998, exports from the port of Kobe to Asian countries declined by 24.3 percent from the previous year. The negative impact of damage to the local economy and regional exports, in addition to the relocation of many container cargos to other ports during the port of Kobe's closure contributed to its decline. Further, changing trends in the international trade industry introduced increased



competition from other Asian ports. As a result of these factors, the port of Kobe has not fully recovered. For example, while the port ranked 6th in the world for volume in 1994, it dropped to the 24th position in 1995 and the 33rd in 2006.

**Figure 13: Although the City of Kobe Restored the Port of Kobe by March 1997, the Port Never Fully Recovered**



Source: City of Kobe.

Local industries, such as chemical and steel manufacturers as well as small businesses, were also affected by the earthquake. Chemical and steel manufacturers did not operate for several months after the event. Large companies, such as Kobe Steel and Mitsubishi Industries, were able to map out effective recovery strategies and were less affected by the earthquake. On the other hand, smaller industries, also severely damaged by the earthquake, were unable to recover as easily as the larger manufacturers. For example, smaller businesses such as shoe manufacturers, sake breweries, and roof-tile makers never fully recovered from the earthquake.

The city of Kobe took several actions to stimulate the local economy with mixed success. For example, Kobe established support systems for affected businesses such as special no-interest loans and subsidies for the construction of temporary stores and factories. The city also created the “Luminaire,” a festival of illuminated lights which began in the winter following the earthquake to boost morale of local residents and to attract tourists. In 2003, the event drew 28.1 million visitors, which increased the number of tourists by 115 percent from pre-earthquake levels. However, not all of its efforts were successful. For example, the city did not have

enough funds to help all the small businesses that needed financial assistance. Some small businesses could not recover from the earthquake and closed.

Recognizing the need to diversify Kobe's economy from its traditional port and manufacturing businesses, the city took steps to attract and develop several new industries. Kobe recognized that it could benefit from new infrastructure projects to change the industrial base of the city. Soon after the disaster occurred, the city conducted a study to assess economic conditions in Kobe. This study showed that although some of the economic challenges the city faced were a result of the earthquake, a more fundamental problem was Kobe's continued reliance on "old economy" industries, such as shipbuilding, steel, and shoe manufacturing. With this information, the city, in coordination with Hyogo prefecture, targeted new industries—such as medical, pharmaceutical, robotics, and information technology companies—to establish businesses in the region.

To attract companies from these targeted industries, the city of Kobe and Hyogo prefecture offered loans, subsidies, tax incentives, and inexpensive office space. Further, these jurisdictions proposed reductions in existing government regulations for the medical and information technology sectors. These plans allowed foreign researchers to work in Kobe without overly rigorous visa regulations. Additionally, the city sought to remove regulations that prevented foreign firms from participating in the medical industry and thereby encourage the entry of foreign researchers and business persons. Overall, Kobe and Hyogo achieved success in diversifying its economy. About 10 years after the earthquake, over 285 new companies moved to the city, 40 of which were foreign firms. Additionally, six public facilities—including centers for business, developmental biology, and health care—had relocated to the city as well.

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## Infrastructure

The Kobe earthquake caused significant damage to the infrastructure and transportation network in affected areas. Extensive rail and roadway damage included the collapse of significant portions of three major freeway routes, damage to rail systems, and the collapse of Kobe's subway stations. There was also significant damage to the water, gas, and sewer systems. Over a million households lost access to water, gas, electricity, and sewage after the earthquake. The national government prioritized the replacement of the public infrastructure and set aside the largest portion of its financial support for the reconstruction of essential infrastructure (such as water and sewage systems) and transportation networks.

The national Ministry of Construction was directly involved to assist the city and prefecture with the reconstruction. For example, the ministry provided resources for the replacement of electric power, water, and other utilities. Because of the government's prioritization of these issues, the damaged infrastructure was restored in a relatively short time. Reconstruction of rail lines, some of which are privately owned, was completed within 7 months. Collapsed freeways, including the Hanshin Expressway, were restored within 20 months of the earthquake. See figure 14 for images of restored rail lines and freeways after the earthquake. Similarly, utility services were also quickly repaired. Residents regained electricity in about 6 days and were able to access gas, water, and waste system services in less than 3 months after the earthquake.

Figure 14: Japan Restored Damaged Railways and Highways Approximately 20 Months after the Earthquake



*Above left and above right.* Damaged railways were restored by August 1995, seven months after the earthquake.

*Far left and near left.* The Japanese government restored collapsed highways, including the Hanshin Expressway. The project was complete 20 months after the earthquake.

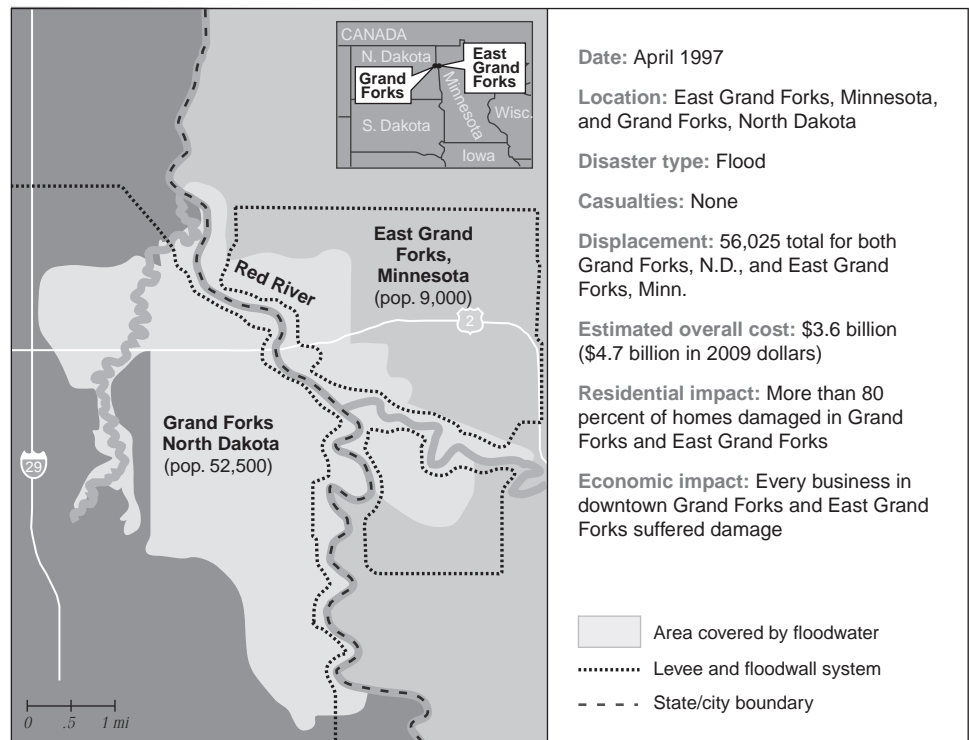
Source: City of Kobe.

# Appendix VI: Grand Forks/Red River Flood

## Disaster Impacts

The 1997 Grand Forks/Red River flood devastated Grand Forks, North Dakota, and East Grand Forks, Minnesota. Following a season of record snowfall, the Red River flooded up to 2,200 square miles in these states, an area about twice the size of Rhode Island. The flood damaged 83 percent of affected homes and impacted all downtown businesses. In East Grand Forks, 99 percent of homes and businesses were damaged (see fig. 15).

**Figure 15: Selected Facts about the Impact of the 1997 Grand Forks/Red River Flood**



Sources: GAO presentation of data from the Federal Emergency Management Agency and the National Oceanographic and Atmospheric Agency.

## Long-term Recovery Snapshot

The federal government provided significant funding to the affected area to facilitate its recovery from the 1997 Grand Forks/Red River flood. Some examples of federal assistance for recovery are shown in figure 16.

**Figure 16: Examples of Federal Assistance for Recovery from the Grand Forks/Red River Flood**

Congressional supplemental appropriation	Assistance from selected federal agencies
<p>\$5.8 billion for flooding and other natural disasters (\$7.6 billion in 2009 dollars)</p> <p><i>Public Law 105-18 (June 12, 1997)</i></p>	<ul style="list-style-type: none"> <li>• Federal Emergency Management Agency Public Assistance grants: \$357 million (\$466 million in 2009 dollars)</li> <li>• Department of Housing Community Development Block Grants: \$142 million (\$186 million in 2009 dollars)</li> <li>• Commerce Economic Development Administration grants: \$66 million for 124 projects (\$86 million in 2009 dollars)</li> </ul>

Sources: Presentation of GAO analysis of Appropriation Acts; GAO summary of documents from the city of Grand Forks, N.D.; and data from the Federal Emergency Management Agency and the Economic Development Administration.

Key aspects of disaster recovery include planning, housing, economic development, and infrastructure. The following presents an overview of selected recovery efforts after the Grand Forks/Red River flood in each of these areas. However, it does not provide a comprehensive account of recovery actions taken.

## Planning

In the wake of the flood, the mayor of Grand Forks asked directors from the city’s urban development, public works, and finance departments to collaborate in order to contribute their respective expertise to help the city create a recovery plan. The mayor delegated much of her authority to these civil servants, known as the Tri-Chairs, allowing them to set priorities for recovery, submit action steps for approval, and collectively manage the city’s recovery resources. The Tri-Chairs, City Council, representatives from the federal Department of Housing and Urban Development (HUD), and other city staff collaborated to create a detailed flood recovery action plan for the city that identified (1) broad recovery goals, (2) roles and responsibilities associated with specific projects, and (3) potential sources for funding those activities. Specifically, the plan identified five broad recovery goals covering areas such as housing and community redevelopment, business redevelopment, and infrastructure rehabilitation. The plan details a number of supporting objectives and tasks to be implemented in order to achieve the stated goals. Additionally, the plan identified a target completion date for each task.

Consultants that provided technical assistance on the planning process were hired using HUD's Community Development Block Grant (CDBG). A key role that these federally-funded consultants played was to maintain good communications and coordination between the city and HUD. The consultants facilitated communications through scheduling and publicizing meetings, providing workspace, and convening weekly conference calls. According to a subsequent evaluation of the consultants' efforts, these activities helped to build a team mentality among stakeholders by encouraging the sharing of information and common problem-solving. An important result of this communication was the completion of Grand Forks' recovery plan. A city evaluation of the recovery plan found that the process of specifying goals and identifying funding sources allowed the city to conceive and formulate projects in collaboration with the city council and representatives from state and local governments. This helped Grand Forks meet its recovery needs as well as adhere to federal and state disaster assistance funding laws and regulations.

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## Housing

The cities of Grand Forks and East Grand Forks took measures to buy out housing located in the 100-year floodplain of the Red River. Grand Forks officials developed a buy-out program that purchased nearly 800 homes, which was about 10 percent of the city's housing stock at the time. To determine the value of properties in the buy-out program, the city created teams to assess each home and based the value on pre-flood price of the home along with a deduction of insurance payments. According to a Grand Forks official, the city also changed existing land-use ordinances to prevent future building in the 100-year flood zone.

In East Grand Forks, where nearly 99 percent of the homes were damaged by the flood, officials also established a buy-out program for approximately 400 homes located in the 100-year floodplain. The city used local realtors to determine property values, and the city provided a 7 to 10 percent premium above the house value to account for rebuilding costs. East Grand Forks used U.S. Army Corps of Engineers and the Federal Emergency Management Agency's (FEMA) Hazard Mitigation Grant Program funding to support its buy-out program.

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## Economic Development

To focus on issues of economic recovery, the mayor of Grand Forks formed a task force on business redevelopment comprised of 15 prominent business leaders to address issues such as getting access to funding for business recovery and increasing opportunities for business

development and growth. The business redevelopment task force comprised of seven committees that met regularly to discuss these issues. Grand Forks created several business redevelopment programs using federal funding. For example, using almost \$2 million from HUD's CDBG program and over \$5 million from the Economic Development Administration, the city constructed Noah's Ark, a large industrial building developed for the purpose of providing temporary office space to any displaced small business in the Grand Forks region. According to a Grand Forks official, the Noah's Ark building was converted into an Amazon.com call center in 1999. The city also developed several projects which incorporated mitigation techniques so those structures would be better prepared for a future flood. For example, the city changed the design of a convention center by raising the main event arena space of a convention center to ground level to mitigate against future flooding. The University of North Dakota also incorporated disaster resistant features into its construction of a new \$100 million hockey arena to protect it from blizzards, floods, and wind.

According to East Grand Forks officials, the city's business community relied upon the University of Minnesota's School of Architecture to development a strategy for economic recovery. As part of its economic redevelopment after the flood, East Grand Forks entered into an agreement with a major outdoor retailer to build a \$7 million store if it were to employ local residents in the store. Since its opening, the retailer has thrived in East Grand Forks and is one of the fastest growing stores in this nationwide chain.

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## Infrastructure

After the flooding, Grand Forks and East Grand Forks took steps to address their cities' lack of an adequate flood-control infrastructure to help reduce damage from future flooding of the Red River. The U.S. Army Corps of Engineers assisted both cities in the construction of new flood protection consisting of levees and floodwall systems. The Grand Forks levees have a diversion channel to redirect water around to the west side of the city. Its flood walls were elevated an additional 3 feet making it possible to add clay to levy to provide more protection in the event of severe flooding. In East Grand Forks, officials explained that the city built a nonpermanent floodwall that can be taken down and assembled when needed, because of concerns about keeping the city open to the view of the river. See figure 17 for images of the Red River before and after the infrastructure construction project.



Figure 17: After the Flood, Grand Forks, North Dakota, and East Grand Forks, Minnesota, Took Steps to Address Their Cities' Lack of an Adequate Flood-Control Infrastructure to Help Reduce Damage from Future Flooding



Sources: Photographs courtesy of Grand Forks Herald, Photographer: Eric Hylden (top left); North Dakota State Water Commission (top right); National Oceanic and Atmospheric Administration (bottom).

In December 1998, Grand Forks and East Grand Forks jointly agreed to create a “greenway,” which would manage the impact of rising river water as well as provide a natural space located between the levee system and river banks for recreational uses. For example, the greenway includes trails, golf courses, boat-ramps, campgrounds, athletic fields, and a wildflower garden. These infrastructure improvements, including the greenway and permanent river dikes, have successfully reduced property damage in subsequent floods. During a severe flood in 2006, Grand Forks only incurred minor infrastructure and property damage, as compared to the damage suffered in the 1997 flooding.

After the 1997 flood, Grand Forks’ water treatment and distribution facilities were inundated with flood water and suffered heavy damage, resulting in no water service for 13 days and no drinkable water for 23 days. Grand Forks’ water system suffered significant damage and needed repairs to restore the water distribution and treatment facilities. The city used various federal and state funds for the restoration, including approximately \$5.3 million from FEMA. The city experienced challenges during the sewer and water treatment system’s closeout process (the last step of the program’s process, during which FEMA certifies that the recovery work has been completed and eligible costs have been reimbursed). FEMA questioned whether certain damage was pre-existing or occurred as a result of the flood. The city and FEMA came to an agreement after the city provided over 40-hours worth of video documentation of the sewers, showing both previous damage and flood-related damage, which eventually resulted in the successful closeout of the projects.

# Appendix VII: Comments from the Department of Homeland Security

U.S. Department of Homeland Security  
Washington, DC 20528



**Homeland  
Security**

July 22, 2009

Stanley J. Czerwinski  
Director  
Strategic Issues Team  
U.S. Accountability Office  
441 G Street, NW  
Washington, DC 20548

Dear Mr. Czerwinski:

Thank you for the opportunity to review and comment on the Government Accountability Office's (GAO's) Draft Report GAO-09-811 entitled, "DISASTER RECOVERY: Experiences from Past Disasters Offer Insights for Effective Collaboration after Catastrophic Events."

**Recommendation:** "To improve the ability of the federal government to capture and disseminate recovery information, we recommend that the Secretary of Homeland Security direct the Administrator of FEMA to establish a mechanism for sharing information and best practices focused on disaster recovery, including practices that promote effective collaboration such as those discussed in this report. Options for doing this could include (1) creating an approach, similar to the LLIS Web site or the mitigation best practices portfolio, through which disaster recovery lessons can be compiled and shared, and personal networks among interested recovery officials encouraged; and/or (2) modifying the LLIS Web site to add a focus on recovery by taking steps such as including more recovery documents, creating a recovery topic area within LLIS, and creating an online directory for recovery officials to encourage networking and facilitate further sharing of recovery experiences."

**Response:** Concur. FEMA concurs with the recommendation outlined in the report and will continue to work with our partners to identify, and establish as needed, an appropriate information sharing mechanism that will improve the ability of the federal government to capture and disseminate recovery information. FEMA will evaluate all options that will promote and improve effective collaboration processes, including those suggested by GAO.

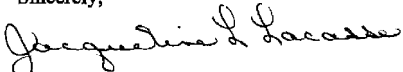
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**Appendix VII: Comments from the  
Department of Homeland Security**

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Thank you again for the opportunity to comment on this Draft Report and we look forward to working with you on future homeland security issues.

Sincerely,

  
Gerald E. Levine  
Director  
Departmental GAO/OIG Liaison Office

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# Appendix VIII: GAO Contact and Staff Acknowledgments

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## GAO Contact

Stanley J. Czerwinski, Director, Strategic Issues Team, (202) 512-6808 or CzerwinskiS@gao.gov.

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## Acknowledgments

In addition to the contact named above, Peter Del Toro, Assistant Director, and Shirley Hwang were the major contributors to this report. Additionally, Patrick Breiding, Keya Chateaufneuf, Christopher Harm, Donna Miller, and Diana Zinkl also made key contributions.

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