

MITIGATION

Identifying and Prioritizing Risk Reduction Actions in Your Community

By now you know the sorts of hazards that may threaten your community and the neighborhoods and areas most likely to be hit the hardest. You also should have specific details about the buildings and systems that are most at risk. Now your community needs to target resources and prioritize its mitigation activities. This chapter will help you prioritize the actions you can take to reduce your existing disaster potential.



CASE STUDY

LOS ANGELES, CA



Keeping Children Safe: A Path to the Future

As your community searches to define its priorities, often the health and safety of your citizens will continue to be at the center of conversation. Ensuring that those most vulnerable—children and seniors—are safe during times of disaster will be at the forefront of most participants' thoughts. It was this priority that prompted the people of Los Angeles to undertake a major school mitigation program after the 1994 Northridge earthquake.

In the early dawn of January 17, 1994—Martin Luther King, Jr. Day—the Northridge Earthquake struck Los Angeles. Clearly, the structural mitigation for schools begun in California in 1933 had been successful. But it did not take long for everyone to come to a very scary but real conclusion: If the earthquake had struck on a school day, thousands of L.A. schoolchildren would have been seriously or even gravely injured by non-structural elements. Having avoided this horrendous possibility, the leaders of Los Angeles, working with FEMA, embarked on an unprecedented seismic retrofitting plan to remove the danger of falling lights in their schools.

The L.A. school district is second in size only to the one in New York City, providing public educational services to more than 800,000 students in a 708-square mile area. At present, the L.A. school district is composed of over 900 schools and employs 57,000 full-time and 24,000 part-time staff.

The suspended ceiling and imbedded pendant lighting systems have been proven to be dangerous to people who are in buildings subject to earthquakes: They fall from the ceiling when shaken by strong seismic motion. The Northridge Earthquake caused hundreds of lighting units to fall onto desks in classrooms that the students and teachers would normally occupy during a school day. In fact, over 5,500 school buildings were damaged that day.

By prioritizing and protecting their schools, the people of Los Angeles ensured the safety of their children and educators, protecting the living foundation of their future.



PRIORITIZING MITIGATION EFFORTS

An active and effective *Disaster Resistant Community Planning Committee* will want to determine what they can do to address the community's risk for disasters. It is important that a community identify its own mitigation priorities—using its own reasons and mitigation goals—when carrying out Project Impact. Each partner on the *Disaster Resistant Community Planning Committee* may have a different top priority. In that instance, the Community CEO or committee leader will need to negotiate a balanced, reasoned agreement among all the partners on a short- and long-term mitigation strategy.

See the Community Partners Checklist about conducting a successful meeting at the back of the guidebook.

The goal of the *Disaster Resistant Community Planning Committee* at this juncture is to identify mitigation priorities, to identify the mitigation measures you will take to complete those priorities, and to identify the appropriate sources for the financial and other needed supports to achieve those measures.

▶ In the process of planning where to conduct risk reduction actions, the committee will be making decisions about what is most critical to the public good and the future of the community. Public buildings and facilities are often considered in such decisions:

- Health and safety functions often come to the top of the list (e.g., hospitals, fire stations, police stations)
- Public schools are crucial—in addition to the obvious fact that our children are there, they often serve as shelters
- Public utility and transportation systems are critical in response and recovery circumstances
- Courthouses might be important for the reliability of access to business or tax records

Refer to rationale on pages 8-10 for more detailed information about why these entities are important.

▶ Remember to consider the vast majority of private buildings beyond the public structures—the commercial, non-profit, and residential structures—these are often the backbone of our communities:

- Hospitals and health care facilities
- Private schools
- Residential neighborhoods of both single and multi-family dwellings
- Shopping malls and shopping areas
- Industrial sites and parks



► In designing the disaster resistance level a community wants to achieve, it is crucial that a community make decisions about priorities as a group, considering as many different perspectives as possible. Once it has, it can begin to find the appropriate resources for carrying out those priorities.

THE TOOLS TO REDUCE YOUR RISKS Mitigation Measures

► Three major categories of action will emerge as you examine the mitigation measures your community wants to implement:

- Improving the quality and detail of your hazard identification and vulnerability assessments
- Reducing your community's and your children's future losses from natural disasters
- Reducing your community's potential for disasters

See the Mitigation Checklist at the back of the guidebook for more specific information.

IMPROVING HAZARD IDENTIFICATION AND VULNERABILITY ASSESSMENTS Quantifying Expected Losses

► In Chapter 2, we discussed actions your community can take to improve the quality and level of detail in defining the hazards that threaten you. The following information will be most useful to you as you begin to specify mitigation efforts:

- Geographic Information Systems (GISs) can be used to store and rapidly access the mapping information that helps picture the areas and neighborhoods at risk. Equally important, a GIS database will allow you to program, or utilize an existing program, to estimate your losses. These estimates not only help you understand the scope of disaster problem with which you are faced, but also facilitate the identification of mitigation opportunities.
- Improved topographic information, soils data, and the like may be obtained from your State Geological Survey. Such data can greatly improve your delineation of flood, tidal surge, or earthquake hazards, in addition to your estimation of losses from a natural hazard.
- FEMA's Hazards U.S. (HAZUS) program can be provided to you. It already has digitized building data and can be updated with your tax assessment maps or other databases. In addition, HAZUS has a loss-estimation program for earthquakes; work is proceeding to incorporate updates that include flood and hurricane loss estimates, as well.
- Detailed examinations of structural risks can be achieved with the help of local engineers and should be considered whenever engineered structures are the target of a mitigation measure. Technical assistance materials for the conduct of such examinations can be obtained from FEMA and other sources.

► The private sector is a key ingredient. The capability and need for the commercial sectors to address their exposure to losses and to become disaster resistant businesses with disaster resistant jobs by contributing to a disaster resistant community cannot be overstated.

MITIGATION IN NEW CONSTRUCTION AND COMMUNITY GROWTH

Through the measures you implement to mitigate risks in new construction and community growth, you will help ensure that the relative risk in your community, town, city, or county does not increase in the future. Most of the decisions will revolve around the way the *Disaster Resistant Community Planning Committee* expects your new buildings to perform during the hazard events whose effects you want to mitigate. You will want to avoid life-threatening collapses; however, you might determine whether higher levels of performance—reparable damage, continued functioning—will be needed due to the critical nature of the building. Building codes and their enforcement through site inspections by a knowledgeable person will help achieve this goal.

Community growth and capital development should be planned to avoid or minimize potential losses. Community growth management plans and their enforcement will help your community to grow into safer areas, or to grow safely in hazardous areas. *See sidebar at right and on page 24 for specific mitigation measures.*

► One of the first things the *Disaster Resistant Community Planning Committee* will want to do in Phase Three is to review existing policies and practices relating to hazard regulation, including:

- Community growth management planning
- Land use planning and regulation
- Subdivision decisions
- Transportation planning
- Planning for open spaces
- Conservation and recreation
- Public safety and housing
- Preservation of historic resources



Mitigation measures dealing with community growth may include:

- Plan for open space acquisition of high hazard potential areas.
- Adopt policies that require consideration and mitigation of identified hazards when decisions are made with respect to subdividing or consolidating parcels, changing land uses, or redevelopment.
- Provide incentives—such as density bonuses, waivers of fees, set asides, reduced parking requirements, and ability to transfer development credits to less hazardous areas—to building owners to encourage investment in Project Impact and other projects that reduce disaster losses.
- Develop incentives to encourage owners of buildings and facilities to undertake projects that will improve the performance of their structures when subjected to the forces of natural hazards (such as the real estate transfer tax rebate, permit fee waivers, or making available residential seismic upgrades through grants, loans, and other mechanisms).
- Identify disincentives and recommend steps to remove them.
- Identify and seek legislation needed to provide incentives.
- Consider use of redevelopment to finance and manage building retrofit efforts.
- Determine whether there are incremental mitigating improvements that can be made to facilities as part of ongoing maintenance and performance enhancements.
- Upgrade plumbing and electrical systems and anchor architectural finishes and equipment.
- Support community efforts to improve or replace vulnerable utilities and transportation systems.

Refer to the Resource ID Checklist at the back of the guidebook for more information about incentives.

Mitigation measures to improve code enforcement:

- Provide training for plan checkers and inspectors regarding code requirements and the principles pertinent to the hazard.
- As part of the building code, adopt administrative procedures (“triggers”) to require owners to evaluate the likely structural performance of their buildings contingent upon a change of use or project initiation that increases the number of occupants due to a change in occupancy type or size of the building.
- Adopt ordinances or guidelines that will guide owners’ efforts taken to reduce the probability of future losses. Anticipate application of new retrofit guidelines.
- Create a process to consider codes drafted by outside organizations and to garner endorsement from the local engineering community.
- Review the codes used by the city to determine whether they address the hazards identified for the city.
- Survey the building safety department to determine whether their resources and competencies are sufficient to carry out plan review and construction inspection needed to assure quality construction.
- Provide public information activities. (*Chapter 4 discusses specific ways to communicate Project Impact to your community.*)



One of the best ways to enhance mitigation in your community is to develop new public policies. Integrate multi-hazard risk reduction into the ongoing activities of the city and of the local partners by drafting policies to reduce losses for consideration by all Project Impact partners, especially the decision-makers, the workforce, and the community at large.

REDUCING THE POTENTIAL FOR DISASTERS TODAY

Mitigation in Existing Construction

Experience has shown that effective mitigation actions in buildings and facilities currently at risk can reduce disaster losses significantly. At the back of the guidebook, there is a list of actions you can take to address specifically each of the major hazards. See *Mitigation Measures Checklist*.

It is always worthwhile to have expert advice and input about the selection of the most cost-beneficial technique for your community’s risks, but in many instances the best selection may be obvious. In identifying what will be rehabilitated or retrofitted, the *Disaster Resistant Community Planning Committee* should try to empower the building owners, facilities owners, or homeowners to identify the effective mitigation measure they would prefer to implement.

The committee can provide language for revisions or updates to the community’s general (or comprehensive) plan that discusses natural hazard issues and policies relevant to the considerations described above. By incorporating improved hazard identification data into the plan, for example, your community will incorporate mitigation into its day-to-day decision-making.

PROJECT IMPACT'S MITIGATION PLAN

Listing Your Priorities

Your final step in implementing Project Impact is to prepare a long-term plan that specifies a strategy for accomplishing your goals. It should describe objectives with specific deadlines, assign responsibility for each element, identify participants for each task, specify needed resources and expected sources, and set priorities. The plan should include the activities that each of your Project Impact partners can contribute to your disaster resistance goals.

IDENTIFYING AND PRIORITIZING RISK REDUCTION ACTIONS IN YOUR COMMUNITY SUMMARY

Purpose

- Estimate the consequences of natural hazards to your community by matching the information about hazards to vulnerability.
- Identify the community's mitigation priorities.
- Identify preferred mitigation measures.
- Develop a strategic plan that reflects the community's priorities, resources, and preferred mitigation measures.

Products

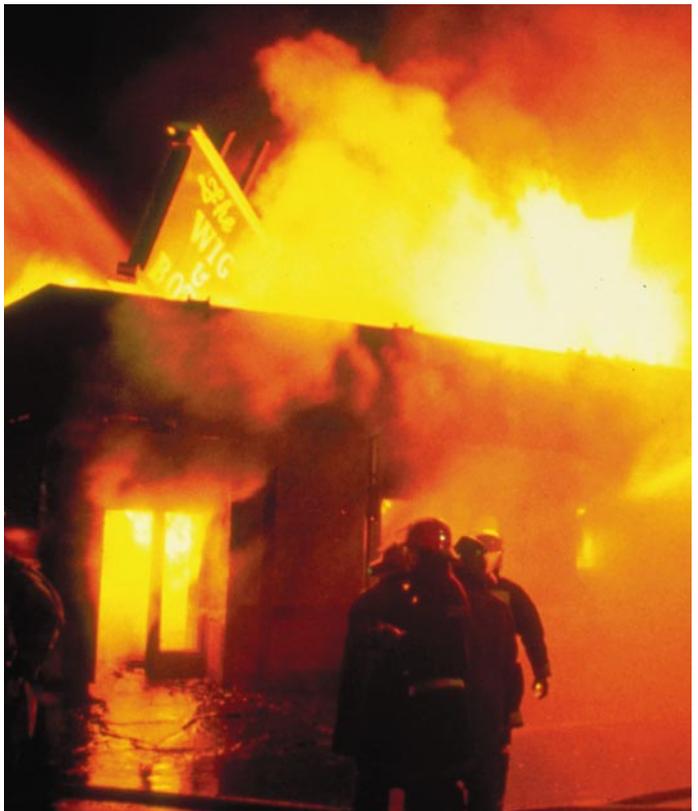
- Equipment and training needed to run a GIS database or the FEMA-supplied HAZUS.
- Realistic scenarios of estimated losses and the consequences for consideration by the community and decision-makers. The consequences should be expressed in terms of criticality to the community. Estimated casualties, estimated value of direct losses, disruption and loss of infrastructure services, losses from fire, and economic losses due to all of these factors help drive the process of identifying priorities. The analysis allows the community to determine which elements appear to be the cause of these losses and to consider the efficacy of different mitigation strategies.
- An understanding of the likelihood of

damage caused by a given natural disaster and an estimation of its consequences on the community—its residences and businesses.

- Identification of where damage and loss of functionality are expected to occur (e.g., locations, types of buildings, utility, and transportation system elements).
- A strategic mitigation plan based on identification of community mitigation priorities, preferred mitigation measures, and the resources needed to carry out the strategy.

► Upon completion of the Third Phase of Project Impact, you should have:

- Assessed your community's disaster risk
- Begun to seek community input
- Analyzed all information related to public and private buildings
- Identified and implemented mitigation actions relevant to your risks
- Developed policies pertaining to community growth
- Prepared a long-term Project Impact plan
- Begun to identify and apply potential resources for carrying out priorities



CHECKLIST

MITIGATION MEASURES



WILDFIRE MITIGATION ACTIONS	
Site	
Remove vegetation and combustible materials around structures	
Provide more than one means of access into and out of a community	
Provide fire breaks to prevent the spread of fire	
Provide fire roads to aid in firefighting	
Buildings/Contents	
Replace roofing with fire-resistant materials	
WIND MITIGATION ACTIONS	
Public Works/Utilities	
Electrical	
Provide higher grade poles for electrical distribution.	
Provide guy wires on poles subject to failure	
Provide emergency back-up power to critical facilities: emergency generators, secondary feeds, portable generators with standard camlock connections	
Analyze communication lines on power poles: If they cause unacceptable loads, remove when possible	
Make sure right-of-way around power lines is free of trees or limbs that may cause damage	
Traffic	
Protect traffic lights and other traffic controls from high winds	
Vegetation Thin trees to reduce wind damages and plant species of plants that are more resistant to wind damage	
Emergency Shelters Structurally analyze all buildings or rooms identified as shelters and strengthen these as necessary	
Buildings—Residential and Commercial	
Install shutters on windows and doors or otherwise protect building openings from wind damage	
Ensure that roof-mounted equipment, including cowlings and flashing, is securely mounted to the building	

Install additional connections (such as hurricane straps and tie downs) to resist wind loads	
When re-roofing a building, check and refasten the roof sheathing	
When re-roofing a critical building, consider providing additional protection from water damage (such as a layer of mopped felt)	
When re-roofing a building, avoid gravel or ballast on single-ply-membrane roof: Hurricane force winds could pick this up and damage buildings	
Consider underground electrical service (check on flooding hazard)	
Provide additional bracing for roof trusses	
Reinforce existing unreinforced masonry walls with the addition of reinforced columns and bond beams	
Minimize the number and size of existing windows and other openings and reinforce walls around openings	
Strengthen or select a wind-resistant exterior wall finish	
Inspect installation of pre-engineered metal buildings and strengthen as necessary	
SEISMIC MITIGATION ACTIONS	
Public Works/Utilities	
Replace brittle equipment in electrical substations	
Analyze/strengthen water towers	
Retrofit bridges, overpasses, and other critical transportation links	
Provide shut-off valves in distribution lines for water and gas service	
Buildings/Contents	
Add additional seismic connections through methods such as bolting	
Add shearwalls in buildings	
Brace equipment (such as sprinkler piping) whose failure could lead to increase building damages following an earthquake	
Brace equipment (such as mechanical equipment, chillers, emergency generators, and elevators) whose failure may disrupt the operation of a critical facility, such as a hospital	

List continues on back

CHECKLIST

MITIGATION MEASURES



MITIGATION MEASURES

Brace high value equipment (such as computers and medical equipment) that could topple and get damaged	
Brace equipment that could block building exits or kill or injure people	
Brace parapet walls on buildings; brace or demolish outdoor shelters that pose collapse hazards	
Structurally retrofit unreinforced masonry buildings	
Structurally retrofit roofs during re-roofing	
Provide emergency back-up power to critical facilities: Emergency generators, secondary feeds, portable generators with standard camlock connections	
Harden critical wireless emergency communication systems	
Control use of sites with known high geological and seismic risk	
FLOOD MITIGATION ACTIONS	
Public Works/Utilities	
Protect or elevate ground-mounted transformers	
Elevate vulnerable equipment, electrical controls, and other equipment at waste water treatment plants, potable water treatment plants, and pump stations	
For sewer lines in the floodplain, fasten and seal manhole covers to prevent floodwater infiltration	
Protect wells and other potable water from infiltration and flood damage by raising controls and well pipe	
Replace low bridges or other obstructions that may induce flooding of houses or businesses	
Move building contents to a higher floor or store outside of the floodplain	
Residences	
Elevate existing residences above flood elevation on a new foundation	
Relocate residences outside floodplain	
Acquire and demolish residences	
Store important documents and irreplaceable personal objects (such as photographs) where they will not get damaged	



Elevate or relocate furnaces, hot water heaters, and electrical panels	
Provide openings in foundation walls that allow floodwaters in and out, thus avoiding collapse	
Build and install flood shields for doors and other openings (after evaluating whether the building can handle the forces) to prevent floodwaters' entering	
For drains, toilets, and other sewer connections, install backflow valves or plugs to prevent floodwaters from entering home	
Buy and install sump pumps with back-up power	
Businesses	
Elevate, floodproof, relocate, or demolish buildings	
Store important documents, such as insurance papers and other business papers, where they will not get damaged	
Elevate or relocate furnaces, hot water heaters, electrical panels, and other equipment	
Provide openings in foundation walls that allow floodwaters in and out, thus avoiding collapse	
Build and install flood shields for doors and other openings (after evaluating whether the building can handle the forces)	
For drains, toilets, and other sewer connections, install backflow valves or plugs; these can be tested by a plumber before a flood by plugging the sewer drain and filling waste pipes with clean water	
Backflow of sewer lines can occur outside of the flooded areas, particularly where there are combined sanitary or storm sewer systems; check with the city or county engineer for advice	
Move inventory that may be flooded; reduce inventory that may be flooded, if possible elevating, relocating, or protecting equipment that can be flooded	
Identify stored hazardous materials or other chemicals that could be flooded; and relocate or elevate these	

Please copy for use by planning committee