
NATURAL HAZARD MITIGATION INSIGHTS

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LAND USE PLANNING AND NATURAL HAZARD MITIGATION

Why are we surprised when rampaging waters sweep away homes and businesses that are built in a flood plain? And why is it such a shock each time an earthquake cracks buildings that sit along a fault line? If we don't want to lose entire communities to a hurricane, if we don't want homes turned to ashes in a wildfire, let's stop putting them in harm's way, or at least manage development with natural hazards in mind.

A community develops most sensibly by following a strategic land use plan. Sometimes the process means no development in some areas, denser development in others. We must overcome the perception that land use planning is nothing more than a means to restrict where people reside and work. In reality, land use planning can be a powerful tool in striking a balance between a

community's need to protect its citizens from natural catastrophes and the right of those same citizens to live and work where they please.

Effective planning will reduce the consequences – injuries, deaths, property damage and economic losses – of natural disasters. Traditionally, mitigation efforts in the United States have focused on better building codes, stronger code enforcement and new building techniques and materials. Useful as these approaches may be, the fact is they're insufficient alone to contain losses. If we are to curb the rising human and financial toll of natural disasters, communities need a larger, more comprehensive mitigation framework that includes thoughtful land use decisions as a key component. This report explains the practical and important loss-reduction impacts that planning has for the most destructive hazards: earthquakes, hurricanes, wildfires and floods, as well as others.



Wildfires continue to cause substantial losses. (Photo source on page 8)

WHY ACT NOW?

Because we can't afford to wait. With natural disaster costs already at staggering levels and continuing to soar, communities will pay a heavy price for unwise development should a natural catastrophe occur. They'll pay it through emergency relief funds. They'll pay it through expensive repairs to public buildings and infra-

structure. They'll pay it through lost tax revenues. And they'll pay it through the emotional suffering, physical injuries and deaths of their families, friends and neighbors.

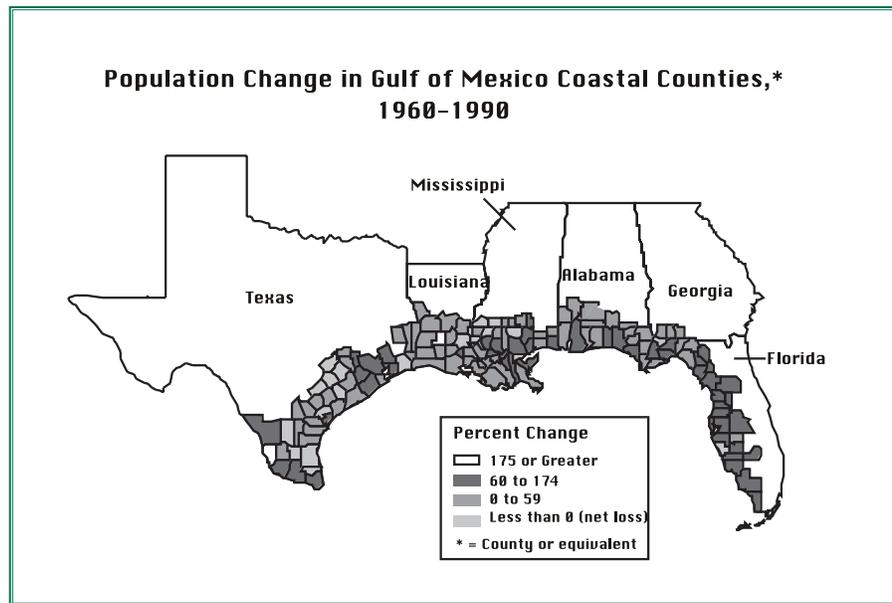
The most important factor contributing to spiraling costs is changing demographics. More people are moving to and building in the areas of the country most prone to natural disasters, such as the Southeast and Gulf Coasts, where hurricanes are most likely to strike, and California and western Washington, where the threat of earthquakes is great. Between 1970 and 1995, the U.S. population grew 29 percent, while Florida's almost doubled and the population of California increased by 63 percent. This trend shows that the nation's population will continue to concentrate directly in nature's path.

Population demographics, coupled with increasing storm cycles, have fueled a steady climb in catastrophic losses. In the six years from 1991 through 1996, dollar losses were more than twice those of the previous decade and more than four times the losses in the 1970s. Between 1990 and 1997, the Federal Emergency Management Agency (FEMA) spent more than \$22 billion on disasters, an increase of 550 percent over the previous decade. Finally, estimates from Property Claim Services (PCS), a division of the American Insurance Services Group, put catastrophe losses paid by the insurance industry since 1989 well above \$42 billion.

LAND USE PLANNING AND MITIGATION - THE BASICS

As planners know, land use planning is the process of deciding whether and how to develop and redevelop land. More than just the simple choice of location, it must take into account transportation, water supply, power, access to schools and parks and population growth and

densities – in short, everything that makes a community what it is. Its comprehensive nature makes land use planning a potentially powerful tool in promoting hazard mitigation as it guides a community's decisions about development and redevelopment.



Source: National Oceanic and Atmospheric Administration (NOAA), Office of Ocean Resources Conservation and Assessment.

Unfortunately, though, there is no single blueprint to follow. As a result, communities take many different approaches to planning, ranging from a detailed description of appropriate and inappropriate uses and locations to no plan whatsoever. Some states give communities no choice at all, but require them to prepare a plan which either advises property owners to follow a set of principles or binds them to prescribed action.

California, Rhode Island and coastal regions in states such as Florida and North Carolina not only require comprehensive plans on the city or county level but also require that the plans include a section on natural hazards. In states that have no statewide legal requirements, communities are free to plan or not plan as they see fit. Regardless, communities should plan, and the plan should account for natural hazards and their mitigation.

Through its Growing SmartSM project, the American Planning Association (APA) offers policy-makers a set of model statutes to help produce up-to-date and workable planning legislation. Designed to be adaptable and flexible, the APA models list the baseline requirements that every local plan should have and suggest

additional factors for consideration. These requirements include such items as utilities, public facilities and housing – and natural hazard mitigation.

MITIGATION PLANNING OFFERS BROAD BENEFITS

Incorporating natural hazard mitigation into land use plans has a number of broad benefits for communities in hazard-prone areas. For example, planning for hazard mitigation can:

- ▶ Put basic information in the public's hands on the types of hazards it faces and the potential consequences. A public aware of its risks and vulnerabilities is more apt to prepare for them.
- ▶ Manage and control the development of land that is subject to natural hazards in a way that's compatible with the frequency and damage potential of these hazards. Putting buildings directly over known fault lines or over washover channels on barrier islands are obvious examples of poor planning. Better choices include pushing development back from a vulnerable shore, preserving sand dunes that cushion a storm's impact and building roads that allow firefighting equipment into a wildfire-hazard area.

Lessons in Loma Prieta

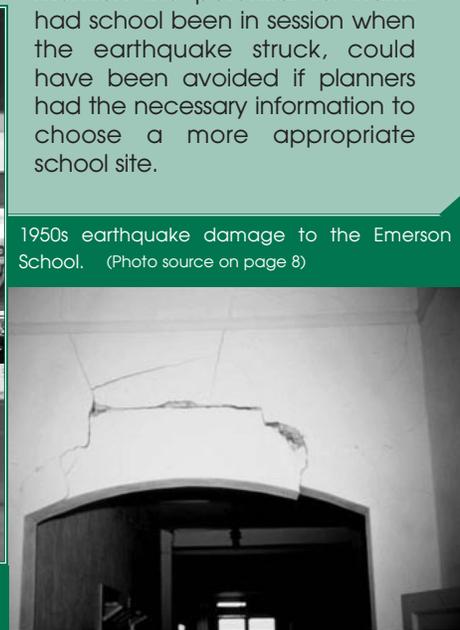
Both the Loma Prieta Elementary School and the 1989 Loma Prieta earthquake in the San Francisco Bay area take their names from a peak in the Santa Cruz Mountains. The school, constructed around 1950 before California required geologic studies of school sites, served the growing community near the earthquake's epicenter. About a year before the earthquake, the school district decided to remodel the elementary school. Trenching revealed at least a dozen fault traces running through the school grounds, many directly under the building itself. Before the school district could carry out plans to abandon the school and move to another site, however, the Loma Prieta earthquake hit and seriously damaged the school by cracking and heaving the ground. Fortunately, the earthquake occurred after school was out for the day. No children or teachers were injured.

After the earthquake, the district decided to build a new elementary school at the middle-school site. Post-earthquake studies revealed faults running through portions of the middle-school site as well, making some of its classroom space unsafe. The new elementary school is now a single-story building specially designed to resist shake damage and positioned away from the fault lines.

The moral? The loss of school buildings, expense and disruption, not to mention the potential for harm had school been in session when the earthquake struck, could have been avoided if planners had the necessary information to choose a more appropriate school site.



Requirements for geologic studies of new school sites could help avoid the sort of damage that occurred outside Mrs. Berry's classroom. (Photo source on page 8)



1950s earthquake damage to the Emerson School. (Photo source on page 8)

- ▶ Balance property owner rights with the social, economic, aesthetic and ecological costs of the development to the entire community. Landowners must accept greater responsibility for the risks they assume when they put structures in harm's way.
- ▶ Limit the consequences of the hazard or, in some instances, avoid it altogether.

Fewer injuries, less demand for public relief funds, greater insurance affordability and availability and a faster recovery for homeowners, private businesses and public services also follow from mitigation.

Land use planning is more than a means for communities to limit building in hazardous areas. Planners can still account for development while using a variety of techniques to control losses and keep them within manageable and sustainable limits. In other words, a strong mitigation element in a land use plan doesn't erect a barrier to growth but actually helps a community keep thriving.

INCORPORATING MITIGATION INTO LAND USE PLANS

Land use planning and hazard mitigation must go hand-in-hand. Preparing separate mitigation and land use plans does work well for some communities, as long as the two plans coordinate with each other. As a general rule, however, it is more effective to incorporate mitigation and land use planning into a comprehensive plan that has a broader reach and is more ingrained in a community and its ongoing programs. In Rhode Island, this is being accomplished at the community level.

A community might consider a stand-alone mitigation plan if it lacks a comprehensive plan, or if the existing plan is weak or outdated. And a recent disaster may create a window of opportunity for forging consensus on a mitigation commitment and strategy even without a comprehensive plan. Under these circumstances, a community could integrate mitigation into its land use plan later.

Finally, *don't confuse an emergency management plan with a hazard mitigation plan*. Emergency managers deal with a crisis as it is happening and with the after-effects when it passes. More operational in

nature, emergency management plans typically stand alone and do not encompass the pre-event loss reduction features of a mitigation plan.

KEY COMPONENTS OF MITIGATION

An effective hazard mitigation plan seeks to ensure that development, both existing and future, is compatible with the hazards facing a community. Whether it is a part of the community's land use plan or stands by itself, a hazard mitigation plan should have certain key components:

- ▶ A statement of guiding principles and goals: minimizing deaths and injuries, for example; protecting lifelines and critical facilities such as hospitals, utilities, bridges and evacuation routes; reducing property damage and economic loss; and restoring people to their homes and businesses after a natural hazard event;
- ▶ A review of the conditions particular to the community, including a history of local hazard events;
- ▶ A description of the natural hazards that threaten the area, including detailed mapping and an analysis of vulnerability and risk;
- ▶ A discussion of specific hazard-mitigation measures the community is committing to;
- ▶ An outline of how at-risk areas will be used and managed over the next 10 to 20 years;
- ▶ A road map of the management and enforcement process, including identification of responsible individuals and agencies, projection of costs and funding and descriptions of any necessary legislative changes; and
- ▶ A discussion of how to monitor the plan's success and how to update it when appropriate so that it is a living document, not an obscure blueprint that is quickly forgotten. The plan should include a list of specific, measurable projects that can be undertaken in the short term (say, one year). This is one way the community can tell if it is meeting plan goals.

PLANNING TOOLS

Specifically, then, how can a land use plan help a community manage the use and development of property to minimize the consequences of natural catastrophes? The planner can choose from a number of tools, including these very important ones:

A Cliffhanger in Oregon

In Oceanside, Oregon, a row of 30 luxury townhomes – costing up to \$400,000 apiece – sits on a grassy dune 150 feet above the waves. Residents enjoyed a beautiful wide beach and great views of the Pacific Ocean in 1997. Today, the views are still great, but the beach beneath the homes is gone. And chances are at least some of the townhomes won't be there for long either. The sand underneath them is eroding, as it has been for several hundred years according to a local geologist.

Oregon is one of the few states that requires its local jurisdictions to have comprehensive land use plans and to “give consideration to” areas subject to natural hazards, such as beaches, dunes and coastal



Coastal erosion and inadequate setback requirements have put many homes at risk, including these in Oceanside, Ore.

B. E. Manley, IBHS

Development Regulations

- ▶ *Zoning and subdivision ordinances* can regulate the type of development that occurs in hazard areas. They can also limit development densities where evacuation routes are tight, lifelines are fragile or soils are likely to shift (in the case of an earthquake). In wild-fire zones, these ordinances can require that streets be wide enough to accommodate fire trucks. In addition, they can require that access to an adequate water supply exists and that landscaping be designed to avoid fueling a fire. One type of zoning, called “cluster development,” concentrates a site’s density on its less hazardous portions. Another zoning tool limits development according to hazard-specific needs. Sanibel Island in Florida limits development to the number of people who can be evacuated in five hours, for instance.

headlands. When these units were being built, a local insurance agent worked with the developer and assumed that local planners made a well-informed decision when approving the developer’s plans to position the units on the dune above the beach. A local dune and wetlands expert, Wilbert Terynik, had recommended a 30-foot setback in one area and 50 feet in another to avoid disturbing the pre-existing vegetation. The planners approved a setback of only 10 feet.

Early in 1998, the homeowners association agreed to assess itself \$650,000 for emergency measures to protect against erosion, such as putting up a wall of boulders and pumping water out of the saturated dune. The state, however, does not permit shoreline engineering to protect new developments and will not allow the work to proceed. One homeowner says her home “is worth about zero right now.” Some have moved their belongings to safer ground.

This story has a moral, too. Don’t assume the mere existence of a land use plan will prevent dramatic situations like this one in Oceanside. Communities must take natural hazards into account in order to make sound land use decisions, and the decisions have to be based on a solid understanding of the hazards. Community leaders must do their homework, and then put the interests of the entire community ahead of those of developers.

- ▶ *Setback regulations* are becoming a significant land use tool. In high-wind coastal areas, they prohibit development of sensitive waterfronts, which take the brunt of storms coming inland. South Carolina, for example, requires that development be set back from the shore a distance of 40 times the average annual beach erosion rate. In seismic areas, setback regulations steer development away from fault lines, unstable slopes and unconsolidated soils. In floodplains, they preserve wetlands and holding areas that absorb floodwaters, thereby minimizing flooding in developed areas.



North Topsail Island, N.C. post-Hurricane Bertha (1996). (Photo source on page 8)



North Topsail Island, N.C. post-Hurricane Fran (1996). (Photo source on page 8)

- ▶ *Dune-protection laws* enacted by state legislatures allow coastal counties to protect dunes, which serve as a first line of defense against storm-surge and flooding from coastal storms. New York, North Carolina, Texas and Virginia all authorize their coastal jurisdictions to deny permits for activities that disrupt sand dunes.

Critical and Public Facilities Policies

- ▶ *Capital improvements* programs limit the availability of necessary urban services in high-hazard areas and thereby discourage improper development. When landowners know that such an area will never have the convenience of nearby public roads, sewer lines and other utilities and public services, they are often less inclined to develop the area inappropriately (e.g., for residential use).

Siting public facilities in areas less prone to damage in a disaster is also justified because it will reduce the costs of reconstructing public property after an event.

Land and Property Acquisition

- ▶ *Acquisition* of open space and undeveloped lands for use as parks and flood holding areas can have enormous benefits. Many communities see open space as a missed opportunity to expand the tax base, so there are usually strong pressures to develop. Open space can actually enhance surrounding property values, however. It can attract revenue to local businesses, decrease the burden on government services and improve the quality of life in the community. In addition, a community can remove the risk to residents by acquiring existing hazard-area development and relocating it to new, more appropriate sites. After the Great Midwest Flood of 1993, more than 10,000

homeowners and business owners voluntarily relocated to drier ground with federal assistance.



North Topsail Island, N.C. post-Hurricane Bonnie (1998). (Photo source on page 8)

- ▶ *Development rights* can be transferred from hazard areas to safer locations. New Jersey state law, for example, (N.J. Stat. Ann. Sec. 40:55D-114 et seq.) authorizes the transfer of development rights within Burlington County by letting owners of sensitive lands separate their development rights from their other rights to the land. Under this law, landowners can sell their rights to develop their property for cash in exchange for a per-

manent restriction on development. Participating communities set up a “bank” to fund the purchases of development rights and to sell them to landowners in areas where growth is more appropriate. The landowners in hazard areas “cash out” by selling their development rights to the bank, which recovers its investment by selling the rights to landowners in less sensitive areas. Owners of sensitive lands don’t lose their investment. And the community benefits by putting development in more suitable areas, while avoiding a constitutional challenge for deprivation of property rights.

Recovery/Reconstruction Policies

- ▶ *A recovery or reconstruction plan* can ensure that any redevelopment of an area devastated by a natural catastrophe incorporates mitigation features that the community did not require initially.

Taxation And Fiscal Policies

- ▶ *Lower taxes* for open space or reduced-density development in hazard areas encourage these more appropriate uses of the land.
- ▶ *Impact taxes* or special assessments can fund the added expense, including future disaster recovery costs, of hazard area development. By making property owners who insist on building in dangerous locations directly responsible for the risks and costs that go along with their decisions, these assessments discourage poor development choices or encourage mitigation. After the Oakland Hills fire of 1991, the city designated the entire hillside area a special assessment district, using the funds for vegetation management and improved fire protection.

Information Dissemination

- ▶ *A full-scale public information campaign* leads to a better-informed citizenry and helps create a political constituency for hazard mitigation.

- ▶ *Hazard disclosure requirements* in real estate transactions provide information that buyers otherwise overlook. For all residential sales, the state of California requires the seller to include a standard disclosure about the home’s seismic-resistance features. Buyers who know that a house should be seismically retrofitted can either make the retrofit a condition of the purchase or negotiate a lower price (demonstrating, again, the importance of a public information program). Houses that are retrofitted should then command a relatively higher market value, which also encourages retrofitting as a general practice.

CONCLUSION

Development pressures will only increase as the nation’s population expands, and hazard-sensitive areas like California and Florida will face even more strain. This situation makes land use planning, which is too often overlooked as part of the answer to surviving natural disasters, more important than ever. Without it, decision-makers will continue to allow people to position their homes and businesses unwisely. Rather than incorporating mitigation efforts as an afterthought to development, communities must establish a sound land use strategy that starts with natural hazard mitigation. And every person should take advantage now of the opportunity to make a difference in their communities. After all, it’s our responsibility, too, to make where we live, work and play as safe as possible.



Monty Hampton, U.S. Geological Survey

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Photo Sources

Pg. 1 Photo courtesy of the Brevard County Office of Emergency Management in cooperation with the Brevard County Fire Department.

Pg. 3 Mrs. Berry's Classroom: Photo courtesy of the Loma Prieta School District, Los Gatos, California.

Pg. 3 Emerson School (1952): Photo courtesy of the Steinbrugge Collection, Earthquake Engineering Research Center, University of California, Berkeley.

Pg. 6 Post-storm aerial photographs of Topsail Island, NC taken after Hurricanes Bertha, Fran and Bonnie (taken 7/16/96, 9/7/96 and 8/28/98 respectively). The georeferenced photographs are part of the U.S. Geological Survey's Severe Storm Project and can be accessed on the Internet at <http://coastal.er.usgs.gov/hurricanes/bonnie>.



An initiative of the insurance industry to reduce deaths, injuries, property damage, economic losses and human suffering caused by natural disasters.

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