

# **Appendix B**

## Resource Directory



## Appendix B: Resource Directory

The Resource Directory, provided by the Disaster Management Area D Coordinator, provides contact information for local, regional, state, and federal programs that are currently involved in hazard mitigation activities. The Hazard Mitigation Action Committee may refer to the organizations on the following pages for resources and technical assistance. The Resource Directory provides a foundation for potential partners in action item implementation.

### American Public Works Association

Level: National	Hazard: Multi	<a href="http://www.apwa.net">http://www.apwa.net</a>	
2345 Grand Boulevard		Suite 500	
Kansas City, MO 64108-2641		Ph: 816-472-6100	Fx: 816-472-1610

Notes: The American Public Works Association is an international educational and professional association of public agencies, private sector companies, and individuals dedicated to providing high quality public works goods and services.

### Association of State Floodplain Managers

Level: Federal	Hazard: Flood	<a href="http://www.floods.org">www.floods.org</a>	
2809 Fish Hatchery Road			
Madison, WI 53713		Ph: 608-274-0123	Fx:

Notes: The Association of State Floodplain Managers is an organization of professionals involved in floodplain management, flood hazard mitigation, the National Flood Insurance Program, and flood preparedness, warning and recovery

### Building Seismic Safety Council (BSSC)

Level: National	Hazard: Earthquake	<a href="http://www.bssconline.org">www.bssconline.org</a>	
1090 Vermont Ave., NW		Suite 700	
Washington, DC 20005		Ph: 202-289-7800	Fx: 202-289-109

Notes: The Building Seismic Safety Council (BSSC) develops and promotes building earthquake risk mitigation regulatory provisions for the nation.

### California Department of Transportation (CalTrans)

Level: State	Hazard: Multi	<a href="http://www.dot.ca.gov/">http://www.dot.ca.gov/</a>	
120 S. Spring Street			
Los Angeles, CA 90012		Ph: 213-897-3656	Fx:

Notes: CalTrans is responsible for the design, construction, maintenance, and operation of the California State Highway System, as well as that portion of the Interstate Highway System within the state's boundaries. Alone and in partnership with Amtrak, Caltrans is also involved in the support of intercity passenger rail service in California.

## California Resources Agency

Level: State	Hazard: Multi	<a href="http://resources.ca.gov/">http://resources.ca.gov/</a>
1416 Ninth Street	Suite 1311	
Sacramento, CA 95814	Ph: 916-653-5656	Fx:

Notes: The California Resources Agency restores, protects and manages the state's natural, historical and cultural resources for current and future generations using solutions based on science, collaboration and respect for all the communities and interests involved.

## California Division of Forestry (CDF)

Level: State	Hazard: Multi	<a href="http://www.fire.ca.gov/php/index.php">http://www.fire.ca.gov/php/index.php</a>
210 W. San Jacinto		
Perris CA 92570	Ph: 909-940-6900	Fx:

Notes: The California Department of Forestry and Fire Protection protects over 31 million acres of California's privately-owned wildlands. CDF emphasizes the management and protection of California's natural resources.

## California Division of Mines and Geology (DMG)

Level: State	Hazard: Multi	<a href="http://www.consrv.ca.gov/cgs/index.htm">www.consrv.ca.gov/cgs/index.htm</a>
801 K Street	MS 12-30	
Sacramento, CA 95814	Ph: 916-445-1825	Fx: 916-445-5718

Notes: The California Geological Survey develops and disseminates technical information and advice on California's geology, geologic hazards, and mineral resources.

## California Environmental Resources Evaluation System (CERES)

Level: State	Hazard: Multi	<a href="http://ceres.ca.gov/">http://ceres.ca.gov/</a>
900 N St.	Suite 250	
Sacramento, Ca. 95814	Ph: 916-653-2238	Fx:

Notes: CERES is an excellent website for access to environmental information and websites.

## California Department of Water Resources (DWR)

Level: State	Hazard: Flood	<a href="http://www.dwr.water.ca.gov">http://www.dwr.water.ca.gov</a>
1416 9th Street		
Sacramento, CA 95814	Ph: 916-653-6192	Fx:

Notes: The Department of Water Resources manages the water resources of California in cooperation with other agencies, to benefit the State's people, and to protect, restore, and enhance the natural and human environments.

## California Department of Conservation: Southern California Regional Office

Level: State	Hazard: Multi	<a href="http://www.consrv.ca.gov">www.consrv.ca.gov</a>
655 S. Hope Street	#700	
Los Angeles, CA 90017-2321	Ph: 213-239-0878	Fx: 213-239-0984

Notes: The Department of Conservation provides services and information that promote environmental health, economic vitality, informed land-use decisions and sound management of our state's natural resources.



#### California Planning Information Network

Level: State	Hazard: Multi	<a href="http://www.calpin.ca.gov">www.calpin.ca.gov</a>	
		Ph:	Fx:

Notes: The Governor's Office of Planning and Research (OPR) publishes basic information on local planning agencies, known as the California Planners' Book of Lists. This local planning information is available on-line with new search capabilities and up-to-the-minute updates.

#### EPA, Region 9

Level: Re- gional	Hazard: Multi	<a href="http://www.epa.gov/region09">http://www.epa.gov/region09</a>	
75 Hawthorne Street		Ph: 415- 947-8000	Fx: 415- 947-3553
San Francisco, CA 94105			

Notes: The mission of the U.S. Environmental Protection Agency is to protect human health and to safeguard the natural environment through the themes of air and global climate change, water, land, communities and ecosystems, and compliance and environmental stewardship.

#### Federal Emergency Management Agency, Region IX

Level: Federal	Hazard: Multi	<a href="http://www.fema.gov">www.fema.gov</a>	
1111 Broadway		Suite 1200	
Oakland, CA 94607		Ph: 510- 627-7100	Fx: 510- 627-7112

Notes: The Federal Emergency Management Agency is tasked with responding to, planning for, recovering from and mitigating against disasters.

#### Federal Emergency Management Agency, Mitigation Division

Level: Federal	Hazard: Multi	<a href="http://www.fema.gov/fima/planhowto.shtm">www.fema.gov/fima/planhowto.shtm</a>	
500 C Street, S.W.		Ph: 202- 566-1600	Fx:
Washington, D.C. 20472			

Notes: The Mitigation Division manages the National Flood Insurance Program and oversees FEMA's mitigation programs. It has a number of programs and activities of which provide citizens protection, with flood insurance; Prevention, with mitigation measures and Partnerships, with communities throughout the country.

#### Floodplain Management Association

Level: Federal	Hazard: Flood	<a href="http://www.floodplain.org">www.floodplain.org</a>	
P.O. Box 50891		Ph: 775- 626-6389	Fx: 775- 626-6389
Sparks, NV 89435- 0891			

Notes: The Floodplain Management Association is a nonprofit educational association. It was established in 1990 to promote the reduction of flood losses and to encourage the protection and enhancement of natural floodplain values. Members include representatives of federal, state and local government agencies as well as private firms.

## Gateway Cities Partnership

Level: Regional	Hazard: Multi	<a href="http://www.gatewaycities.org">www.gatewaycities.org</a>	
7300 Alondra Boulevard		Suite 202	
Paramount, CA 90723		Ph: 562-817-0820	Fx:

Notes: Gateway Cities Partnership is a 501 C 3 non-profit Community Development Corporation for the Gateway Cities region of southeast LA County. The region comprises 27 cities that roughly speaking extends from Montebello on the north to Long Beach on the South, the Alameda Corridor on the west to the Orange County line on the east.

## Governor's Office of Emergency Services (OES)

Level: State	Hazard: Multi	<a href="http://www.oes.ca.gov">www.oes.ca.gov</a>	
P.O. Box 419047			
Rancho Cordova, CA 95741-9047		Ph: 916 845- 8911	Fx: 916 845- 8910

Notes: The Governor's Office of Emergency Services coordinates overall state agency response to major disasters in support of local government. The office is responsible for assuring the state's readiness to respond to and recover from natural, manmade, and war-caused emergencies, and for assisting local governments in their emergency preparedness, response and recovery efforts.

## Greater Antelope Valley Economic Alliance

Level: Regional	Hazard: Multi		
42060 N. Tenth Street West			
Lancaster, CA 93534		Ph: 661-945-2741	Fx: 661-945-7711

Notes: The Greater Antelope Valley Economic Alliance, (GA VEA) is a 501 (c)(6) nonprofit organization with a 501(c)(3) affiliated organization the Antelope Valley Economic Research and Education Foundation. GA VEA is a public-private partnership of business, local governments, education, non-profit organizations and health care organizations that was founded in 1999 with the goal of attracting good paying jobs to the Antelope Valley in order to build a sustainable economy.

## Landslide Hazards Program, USGS

Level: Federal	Hazard: Landslide	<a href="http://landslides.usgs.gov/index.html">http://landslides.usgs.gov/index.html</a>	
12201 Sunrise Valley Drive		MS 906	
Reston, VA 20192		Ph: 703-648- 4000	Fx:

Notes: The NLIC website provides good information on the programs and resources regarding landslides. The page includes information on the National Landslide Hazards Program Information Center, a bibliography, publications, and current projects. USGS scientists are working to reduce long-term losses and casualties from landslide hazards through better understanding of the causes and mechanisms of ground failure both nationally and worldwide.



Los Angeles County Economic Development Corporation

Level: Regional	Hazard: Multi	<a href="http://www.laedc.org">www.laedc.org</a>	
444 S. Flower Street		34th Floor	
Los Angeles, CA 90071		Ph: 213-236-4813	Fx: 213-623-0281

Notes: The LAEDC is a private, non-profit 501 (c) 3 organization established in 1981 with the mission to attract, retain and grow businesses and jobs in the Los Angeles region. The LAEDC is widely relied upon for its Southern California Economic Forecasts and Industry Trend Reports. Lead by the renowned Jack Kyser (Sr. Vice President, Chief Economist) his team of researchers produces numerous publications to help business, media and government navigate the LA region's diverse economy.

Los Angeles County Public Works Department

Level: County	Hazard: Multi	<a href="http://ladpw.org">http://ladpw.org</a>	
900 S. Fremont Ave.			
Alhambra, CA 91803		Ph: 626-458-5100	Fx:

Notes: The Los Angeles County Department of Public Works protects property and promotes public safety through Flood Control, Water Conservation, Road Maintenance, Bridges, Buses and Bicycle Trails, Building and Safety, Land Development, Waterworks, Sewers, Engineering, Capital Projects and Airports

National Wildland/Urban Interface Fire Program

Level: Federal	Hazard: Wildfire	<a href="http://www.firewise.org/">www.firewise.org/</a>	
1 Batterymarch Park			
Quincy, MA 02169-7471		Ph: 617-770-3000	Fx: 617-770-0700

Notes: Firewise maintains a Website designed for people who live in wildfire- prone areas, but it also can be of use to local planners and decision makers. The site offers online wildfire protection information and checklists, as well as listings of other publications, videos, and conferences.

National Resources Conservation Service

Level: Federal	Hazard: Multi	<a href="http://www.nrcs.usda.gov/">http://www.nrcs.usda.gov/</a>	
14th and Independence Ave., SW		Room 5105-A	
Washington, DC 20250		Ph: 202-720-7246	Fx: 202-720-7690

Notes: NRCS assists owners of America's private land with conserving their soil, water, and other natural resources, by delivering technical assistance based on sound science and suited to a customer's specific needs. Cost shares and financial incentives are available in some cases.

National Interagency Fire Center (NIFC)

Level: Federal	Hazard: Wildfire	<a href="http://www.nifc.gov">www.nifc.gov</a>	
3833 S. Development Ave.			
Boise, Idaho 83705-5354		Ph: 208-387- 5512	Fx:

Notes: The NIFC in Boise, Idaho is the nation's support center for wildland firefighting. Seven federal agencies work together to coordinate and support wildland fire and disaster operations.

## National Fire Protection Association (NFPA)

Level: National	Hazard: Wildfire	<a href="http://www.nfpa.org/catalog/home/index.asp">http://www.nfpa.org/catalog/home/index.asp</a>	
1 Batterymarch Park			
Quincy, MA 02169-7471		Ph: 617-770-3000	Fx: 617-770-0700

Notes: The mission of the international non-profit NFPA is to reduce the worldwide burden of fire and other hazards on the quality of life by providing and advocating scientifically-based consensus codes and standards, research, training and education

## National Floodplain Insurance Program (NFIP)

Level: Federal	Hazard: Flood	<a href="http://www.fema.gov/nfip/">www.fema.gov/nfip/</a>	
500 C Street, S.W.			
Washington, D.C. 20472		Ph: 202- 566-1600	Fx:

Notes: The Mitigation Division manages the National Flood Insurance Program and oversees FEMA's mitigation programs. It has of a number of programs and activities of which provide citizens Protection, with flood insurance; Prevention, with mitigation measures and Partnerships, with communities throughout the country.

## National Oceanic /Atmospheric Administration

Level: Federal	Hazard: Multi	<a href="http://www.noaa.gov">www.noaa.gov</a>	
14th Street & Constitution Ave NW		Rm 6013	
Washington, DC 20230		Ph: 202-482-6090	Fx: 202-482-3154

Notes: NOAA's historical role has been to predict environmental changes, protect life and property, provide decision makers with reliable scientific information, and foster global environmental stewardship.

## National Weather Service, Office of Hydrologic Development

Level: Federal	Hazard: Flood	<a href="http://www.nws.noaa.gov/">http://www.nws.noaa.gov/</a>	
1325 East West Highway		SSMC2	
Silver Spring, MD 20910		Ph: 301-713-1658	Fx: 301-713-0963

Notes: The Office of Hydrologic Development (OHD) enhances National Weather Service products by: infusing new hydrologic science, developing hydrologic techniques for operational use, managing hydrologic development by NWS field office, providing advanced hydrologic products to meet needs identified by NWS customers

## National Weather Service

Level: Federal	Hazard: Multi	<a href="http://www.nws.noaa.gov/">http://www.nws.noaa.gov/</a>	
520 North Elevar Street			
Oxnard, CA 93030		Ph: 805-988-6615	Fx:

Notes: The National Weather Service is responsible for providing weather service to the nation. It is charged with the responsibility of observing and reporting the weather and with issuing forecasts and warnings of weather and floods in the interest of national safety and economy. Briefly, the priorities for service to the nation are: 1. protection of life, 2. protection of property, and 3. promotion of the nation's welfare and economy.



#### San Gabriel Valley Economic Partnership

Level: Regional	Hazard: Multi	<a href="http://www.valleynet.org">www.valleynet.org</a>	
4900 Rivergrade Road		Suite A310	
Irwindale, CA 91706		Ph: 626-856-3400	Fx: 626-856-5115

Notes: The San Gabriel Valley Economic Partnership is a non-profit corporation representing both public and private sectors. The Partnership is the exclusive source for San Gabriel Valley-specific information, expertise, consulting, products, services, and events. It is the single organization in the Valley with the mission to sustain and build the regional economy for the mutual benefit of all thirty cities, chambers of commerce, academic institutions, businesses and residents.

#### Sanitation Districts of Los Angeles County

Level: County	Hazard: Flood	<a href="http://www.lacsd.org/">http://www.lacsd.org/</a>	
1955 Workman Mill Road			
Whittier, CA 90607		Ph: 562-699-7411 x2301	Fx:

Notes: The Sanitation Districts provide wastewater and solid waste management for over half the population of Los Angeles County and turn waste products into resources such as reclaimed water, energy, and recyclable materials.

#### Santa Monica Mountains Conservancy

Level: Regional	Hazard: Multi	<a href="http://smmc.ca.gov/">http://smmc.ca.gov/</a>	
570 West Avenue Twenty-Six		Suite 100	
Los Angeles, CA 90065		Ph: 323-221-8900	Fx:

Notes: The Santa Monica Mountains Conservancy helps to preserve over 55,000 acres of parkland in both wilderness and urban settings, and has improved more than 114 public recreational facilities throughout Southern California.

#### South Bay Economic Development Partnership

Level: Regional	Hazard: Multi	<a href="http://www.southbaypartnership.com">www.southbaypartnership.com</a>	
3858 Carson Street		Suite 110	
Torrance, CA 90503		Ph: 310-792-0323	Fx: 310-543-9886

Notes: The South Bay Economic Development Partnership is a collaboration of business, labor, education and government. Its primary goal is to plan and implement an economic development and marketing strategy designed to retain and create jobs and stimulate economic growth in the South Bay of Los Angeles County.



## South Coast Air Quality Management District (AQMD)

Level: Regional	Hazard: Multi	<a href="http://www.aqmd.gov">www.aqmd.gov</a>	
21865 E. Copley Drive			
Diamond Bar, CA 91765		Ph: 800-CUT-SMOG	Fx:

Notes: AQMD is a regional government agency that seeks to achieve and maintain healthful air quality through a comprehensive program of research, regulations, enforcement, and communication. The AQMD covers Los Angeles and Orange Counties and parts of Riverside and San Bernardino Counties.

## Southern California Earthquake Center (SCEC)

Level: Regional	Hazard: Earthquake	<a href="http://www.scec.org">www.scec.org</a>	
3651 Trousdale Parkway		Suite 169	
Los Angeles, CA 90089-0742		Ph: 213-740-5843	Fx: 213/740-0011

Notes: The Southern California Earthquake Center (SCEC) gathers new information about earthquakes in Southern California, integrates this information into a comprehensive and predictive understanding of earthquake phenomena, and communicates this understanding to end-users and the general public in order to increase earthquake awareness, reduce economic losses, and save lives.

## Southern California Association of Governments (SCAG)

Level: Regional	Hazard: Multi	<a href="http://www.scag.ca.gov">www.scag.ca.gov</a>	
818 W. Seventh Street		12th Floor	
Los Angeles, CA 90017		Ph: 213-236-1800	Fx: 213-236-1825

Notes: The Southern California Association of Governments functions as the Metropolitan Planning Organization for six counties: Los Angeles, Orange, San Bernardino, Riverside, Ventura and Imperial. As the designated Metropolitan Planning Organization, the Association of Governments is mandated by the federal government to research and draw up plans for transportation, growth management, hazardous waste management, and air quality.

## State Fire Marshal (SFM)

Level: State	Hazard: Wildfire	<a href="http://osfm.fire.ca.gov">http://osfm.fire.ca.gov</a>	
1131 "S" Street			
Sacramento, CA 95814		Ph: 916-445-8200	Fx: 916-445-8509

Notes: The Office of the State Fire Marshal (SFM) supports the mission of the California Department of Forestry and Fire Protection (CDF) by focusing on fire prevention. SFM regulates buildings in which people live, controls substances which may, cause injuries, death and destruction by fire; provides statewide direction for fire prevention within wildland areas; regulates hazardous liquid pipelines; reviews regulations and building standards; and trains and educates in fire protection methods and responsibilities.

### The Community Rating System (CRS)

Level: Federal	Hazard: Flood	<a href="http://www.fema.gov/nfip/crs.shtm">http://www.fema.gov/nfip/crs.shtm</a>	
500 C Street, S.W.			
Washington, D.C. 20472	Ph: 202- 566-1600	Fx:	

Notes: The Community Rating System (CRS) recognizes community floodplain management efforts that go beyond the minimum requirements of the NFIP. Property owners within the County would receive reduced NFIP flood insurance premiums if the County implements floodplain management practices that qualify it for a CRS rating. For further information on the CRS, visit FEMA's website.

### United States Geological Survey

Level: Federal	Hazard: Multi	<a href="http://www.usgs.gov/">http://www.usgs.gov/</a>	
345 Middlefield Road			
Menlo Park, CA 94025	Ph: 650- 853-8300	Fx:	

Notes: The USGS provides reliable scientific information to describe and understand the Earth; minimize loss of life and property from natural disasters; manage water, biological, energy, and mineral resources; and enhance and protect our quality of life.

### US Army Corps of Engineers

Level: Federal	Hazard: Multi	<a href="http://www.usace.army.mil">http://www.usace.army.mil</a>	
P.O. Box 532711			
Los Angeles CA 90053- 2325	Ph: 213- 452- 3921	Fx:	

Notes: The United States Army Corps of Engineers work in engineering and environmental matters. A workforce of biologists, engineers, geologists, hydrologists, natural resource managers and other professionals provide engineering services to the nation including planning, designing, building and operating water resources and other civil works projects.

### USDA Forest Service

Level: Federal	Hazard: Wildfire	<a href="http://www.fs.fed.us">http://www.fs.fed.us</a>	
1400 Independence Ave. SW			
Washington, D.C. 20250-0002	Ph: 202- 205-8333	Fx:	

Notes: The Forest Service is an agency of the U.S. Department of Agriculture. The Forest Service manages public lands in national forests and grasslands.

### USGS Water Resources

Level: Federal	Hazard: Multi	<a href="http://www.water.usgs.gov">www.water.usgs.gov</a>	
6000 J Street		Placer Hall	
Sacramento, CA 95819-6129	Ph: 916- 278-3000	Fx: 916- 278-3070	

Notes: The USGS Water Resources mission is to provide water information that benefits the Nation's citizens: publications, data, maps, and applications software.

Source: Disaster Management Area D Coordinator, 2004.

Western States Seismic Policy Council  
(WSSPC)

Level: Regional	Hazard: Earthquake	<a href="http://www.wsspc.org/home.html">www.wsspc.org/home.html</a>	
125 California Avenue		Suite D201, #1	
Palo Alto, CA 94306		Ph: 650-330-1101	Fx: 650-326-1769

Notes: WSSPC is a regional earthquake consortium funded mainly by FEMA. Its website is a great resource, with information clearly categorized - from policy to engineering to education.

## Westside Economic Collaborative C/O Pacific Western Bank

Level: Regional	Hazard: Multi	<a href="http://www.westside-la.or">http://www.westside-la.or</a>	
120 Wilshire Boulevard			
Santa Monica, CA 90401		Ph: 310-458-1521	Fx: 310-458-6479

Notes: The Westside Economic Development Collaborative is the first Westside regional economic development corporation. The Westside EDC functions as an information gatherer and resource center, as well as a forum, through bringing business, government, and residents together to address issues affecting the region: Economic Diversity, Transportation, Housing, Workforce Training and Retraining, Lifelong Learning, Tourism, and Embracing Diversity.

# **Appendix C**

## **Economic Analysis Guidelines for Natural Hazard Mitigation Projects**





## **Appendix C: Economic Analysis Guidelines for Natural Hazard Mitigation Projects**

Benefit/cost analysis is a key mechanism used by the state Office of Emergency Services (OES), the Federal Emergency Management Agency, and other state and federal agencies in evaluating hazard mitigation projects, and is required by the Robert T. Stafford Disaster Relief and Emergency Assistance Act, Public Law 93-288, as amended.

This appendix outlines several approaches for conducting economic analysis of natural hazard mitigation projects. It describes the importance of implementing mitigation activities, different approaches to economic analysis of mitigation strategies, and methods to calculate costs and benefits associated with mitigation strategies. Information in this section is derived in part from: The Interagency Hazards Mitigation Team, State Hazard Mitigation Plan, (Oregon State Police – Office of Emergency Management, 2000), and Federal Emergency Management Agency Publication 331, Report on Costs and Benefits of Natural Hazard Mitigation.

This section is not intended to provide a comprehensive description of benefit/cost analysis, nor is it intended to provide the details of economic analysis methods that can be used to evaluate local projects. It is intended to (1) raise benefit/cost analysis as an important issue, and (2) provide some background on how economic analysis can be used to evaluate mitigation projects.

### **PURPOSE**

Mitigation activities reduce the cost of disasters by minimizing property damage, injuries, and the potential for loss of life, and by reducing

emergency response costs, which would otherwise be incurred.

Evaluating natural hazard mitigation provides decision-makers with an understanding of the potential benefits and costs of an activity, as well as a basis upon which to compare alternative projects. Evaluating mitigation projects is a complex and difficult undertaking, which is influenced by many variables. First, natural disasters affect all segments of the communities they strike, including individuals, businesses, and public services such as fire, police, utilities, and schools.

Second, while some of the direct and indirect costs of disaster damages are measurable, some of the costs are non-financial and difficult to quantify in dollars. Third, many of the impacts of such events produce “ripple-effects” throughout the community, greatly increasing the disaster’s social and economic consequences.

While not easily accomplished, there is value, from a public policy perspective, in assessing the positive and negative impacts from mitigation activities, and obtaining an instructive benefit/cost comparison. Otherwise, the decision to pursue or not pursue various mitigation options would not be based on an objective understanding of the net benefit or loss associated with these actions.

### **ECONOMIC ANALYSIS APPROACHES FOR MITIGATION STRATEGIES**

The approaches used to identify the costs and benefits associated with natural hazard mitigation strategies, measures, or projects fall into two general categories: benefit/cost analysis and cost-effectiveness analysis. The distinction between the two methods is the way in which the relative costs and benefits are measured. Additionally, there are varying approaches to assessing the value of mitigation for public sector and private sector activities.

### **Benefit/Cost Analysis**

Benefit/cost analysis is used in natural hazards mitigation to show if the benefits to life and property protected through mitigation efforts exceed the cost of the mitigation activity. Conducting benefit/cost analysis for a mitigation activity can assist communities in determining whether a project is worth undertaking now, in order to avoid disaster related damages later. Benefit/cost analysis is based on calculating the frequency and severity of a hazard, avoided future damages, and risk.

In benefit/cost analysis, all costs and benefits are evaluated in terms of dollars, and a net benefit/cost ratio is computed to determine whether a project should be implemented (i.e., if net benefits exceed net costs, the project is worth pursuing). A project must have a benefit/cost ratio greater than 1 in order to be funded.

### **Cost-Effectiveness Analysis**

Cost-effectiveness analysis evaluates how best to spend a given amount of money to achieve a specific goal. This type of analysis, however, does not necessarily measure costs and benefits in terms of dollars. Determining the economic feasibility of mitigating natural hazards can also be organized according to the perspective of those with an economic interest in the outcome. Hence, economic analysis approaches are covered for both public and private sectors as follows.

#### **Investing in public sector mitigation activities**

Evaluating mitigation strategies in the public sector is complicated because it involves estimating all of the economic benefits and costs regardless of who realizes them, and potentially to a large number of people and economic entities. Some benefits cannot be evaluated monetarily, but still affect the public in profound ways. Economists have developed methods to evaluate the economic feasibility of public decisions that involve a diverse set of beneficiaries and nonmarket benefits.

#### **Investing in private sector mitigation activities**

Private sector mitigation projects may occur on the basis of one of two approaches: it may be mandated by a regulation or standard, or it may be economically justified on its own merits. A building or landowner, whether a private entity or a public agency, required to conform to a mandated standard may consider the following options:

- Request cost sharing from public agencies;
- Dispose of the building or land either by sale or demolition;
- Change the designated use of the building or land and change the hazard mitigation compliance requirement; or
- Evaluate the most feasible alternatives and initiate the most cost effective hazard mitigation alternative.

The sale of a building or land triggers another set of concerns. For example, real estate disclosure laws can be developed which require sellers of real property to disclose known defects and deficiencies in the property, including earthquake weaknesses and hazards to prospective purchasers. Correcting deficiencies can be expensive and time consuming, but their existence can prevent the sale of the building. Conditions of a sale regarding the deficiencies and the price of the building can be negotiated between a buyer and seller.

### **CONDUCTING AN ECONOMIC ANALYSIS**

Benefit/cost analysis and cost-effectiveness analysis are important tools in evaluating whether or not to implement a mitigation activity. A framework for evaluating alternative mitigation activities is outlined below:

1. Identify the Alternatives. Alternatives for reducing risk from natural hazards can include structural projects to enhance disaster resistance, education and outreach, and acquisition or



demolition of exposed properties, among others. Different mitigation project can assist in minimizing risk to natural hazards, but do so at varying economic costs.

2. Calculate the Costs and Benefits. Choosing economic criteria is essential to systematically calculating costs and benefits of mitigation projects and selecting the most appropriate alternative. Potential economic criteria to evaluate alternatives include:

- *Determine the project cost.* This may include initial project development costs, and repair and operating costs of maintaining projects over time.
- *Estimate the benefits.* Projecting the benefits, or cash flow resulting from a project can be difficult. Expected future returns from the mitigation effort depend on the correct specification of the risk and the effectiveness of the project, which may not be well known. Expected future costs depend on the physical durability and potential economic obsolescence of the investment. This is difficult to project. These considerations will also provide guidance in selecting an appropriate salvage value. Future tax structures and rates must be projected. Financing alternatives must be researched, and they may include retained earnings, bond and stock issues, and commercial loans.
- *Consider costs and benefits to society and the environment.* These are not easily measured, but can be assessed through a variety of economic tools including existence value or contingent value theories. These theories provide quantitative data on the value people attribute to physical or social environments. Even without hard data, however, impacts of structural projects to the physical environment or to society should be considered when implementing mitigation projects.
- *Determine the correct discount rate.* Determination of the discount rate can just be the risk-free cost of capital, but it may include the decision maker's time preference and also a risk

premium. Including inflation should also be considered.

3. Analyze and Rank the Alternatives. Once costs and benefits have been quantified, economic analysis tools can rank the alternatives. Two methods for determining the best alternative given varying costs and benefits include net present value and internal rate of return.

- *Net present value.* Net present value is the value of the expected future returns of an investment minus the value of expected future cost expressed in today's dollars. If the net present value is greater than the project costs, the project may be determined feasible for implementation. Selecting the discount rate, and identifying the present and future costs and benefits of the project calculates the net present value of projects.
- *Internal Rate of Return.* Using the internal rate of return method to evaluate mitigation projects provides the interest rate equivalent to the dollar returns expected from the project. Once the rate has been calculated, it can be compared to rates earned by investing in alternative projects. Projects may be feasible to implement when the internal rate of return is greater than the total costs of the project.

Once the mitigation projects are ranked on the basis of economic criteria, decision-makers can consider other factors, such as risk; project effectiveness; and economic, environmental, and social returns in choosing the appropriate project for implementation.

## ECONOMIC RETURNS OF NATURAL HAZARD MITIGATION

The estimation of economic returns, which accrue to building or landowner as a result of natural hazard mitigation, is difficult. Owners evaluating the economic feasibility of mitigation should consider reductions in physical damages and financial losses. A partial list follows:

- Building damages avoided

- Content damages avoided
- Inventory damages avoided
- Rental income losses avoided
- Relocation and disruption expenses avoided
- Proprietor's income losses avoided

These parameters can be estimated using observed prices, costs, and engineering data. The difficult part is to correctly determine the effectiveness of the hazard mitigation project and the resulting reduction in damages and losses. Equally as difficult is assessing the probability that an event will occur. The damages and losses should only include those that will be borne by the owner. The salvage value of the investment can be important in determining economic feasibility. Salvage value becomes more important as the time horizon of the owner declines. This is important because most businesses depreciate assets over a period of time.

### **ADDITIONAL COSTS FROM NATURAL HAZARDS**

Property owners should also assess changes in a broader set of factors that can change as a result of a large natural disaster. These are usually termed "indirect" effects, but they can have a very direct effect on the economic value of the owner's building or land. They can be positive or negative, and include changes in the following:

- Commodity and resource prices
- Availability of resource supplies
- Commodity and resource demand changes
- Building and land values
- Capital availability and interest rates
- Availability of labor
- Economic structure
- Infrastructure
- Regional exports and imports
- Local, state, and national regulations and policies
- Insurance availability and rates

Changes in the resources and industries listed above are more difficult to estimate and require models that are structured to estimate total economic impacts. Total economic impacts are the sum of direct and indirect economic impacts. Total economic impact models are usually not combined with economic feasibility models. Many models exist to estimate total economic impacts of changes in an economy. Decision makers should understand the total economic impacts of natural disasters in order to calculate the benefits of a mitigation activity. This suggests that understanding the local economy is an important first step in being able to understand the potential impacts of a disaster, and the benefits of mitigation activities.

### **ADDITIONAL CONSIDERATIONS**

Conducting an economic analysis for potential mitigation activities can assist decision-makers in choosing the most appropriate strategy for their community to reduce risk and prevent loss from natural hazards. Economic analysis can also save time and resources from being spent on inappropriate or unfeasible projects. Several resources and models are listed on the following page that can assist in conducting an economic analysis for natural hazard mitigation activities.

Benefit/cost analysis is complicated, and the numbers may divert attention from other important issues. It is important to consider the qualitative factors of a project associated with mitigation that cannot be evaluated economically. There are alternative approaches to implementing mitigation projects. Many communities are looking towards developing multi-objective projects. With this in mind, opportunity rises to develop strategies that integrate natural hazard mitigation with projects related to watersheds, environmental planning, community economic development, and small business development,



among others. Incorporating natural hazard mitigation with other community projects can increase the viability of project implementation.

## **RESOURCES**

The following resources for economic analysis have been provided by the Disaster Management Area D Coordinator.

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*Source: Disaster Management Area D Coordinator*



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# **Appendix D**

## List of Acronyms



## Appendix D: Acronyms

### FEDERAL ACRONYMS

AASHTO	American Association of State Highway and Transportation Officials	GIS	Geographic Information System
		GNS	Institute of Geological and Nuclear Sciences (International)
ATC	Applied Technology Council	GSA	General Services Administration
BCA	Benefit/Cost Analysis	HAZUS	Hazards U.S.
BFE	Base Flood Elevation	HMGP	Hazard Mitigation Grant Program
BLM	Bureau of Land Management	HMST	Hazard Mitigation Survey Team
BSSC	Building Seismic Safety Council	HUD	Housing and Urban Development (United States, Department of)
CDBG	Community Development Block Grant	IBHS	Institute for Business and Home Safety
CFR	Code of Federal Regulations	ICC	Increased Cost of Compliance
CRS	Community Rating System	IHMT	Interagency Hazard Team
EDA	Economic Development Administration	NCDC	National Climate Data Center
Mitigation EPA	Environmental Protection Agency	NFIP	National Flood Insurance Program
ER	Emergency Relief	NFPA	National Fire Protection Association
EWP	Emergency Watershed Protection (NRCS Program)	NHMP	Natural Hazard Mitigation Plan (also known as "409 Plan")
FAS	Federal Aid System	NIBS	National Institute of Building Sciences
FEMA	Federal Emergency Management Agency	NIFC	National Interagency Fire Center
FIRM	Flood Insurance Rate Map	NMFS	National Marine Fisheries Service
FMA	Flood Mitigation Assistance (FEMA Program)		
FTE	Full Time Equivalent		

NOAA	National Oceanic and Atmospheric Administration	URM	Unreinforced Masonry
NPS	National Park Service	USACE	United States Army Corps of Engineers
NRCS	Natural Resources Conservation Service	USBR	United States Bureau of Reclamation
NWS	National Weather Service	USDA	United States Department of Agriculture
SBA	Small Business Administration	USFA	United States Fire Administration
SEAO	Structural Engineers Association of Oregon	USFS	United States Forest Service
SHMO	State Hazard Mitigation Officer	USGS	United States Geological Survey
TOR	Transfer of Development Rights	WSSPC	Western States Seismic Policy Council
UGB	Urban Growth Boundary		

**CALIFORNIA ACRONYMS**


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A&W	Alert and Warning	CalEPA	California Environmental Protection Agency
AA	Administering Areas	CalREP	California Radiological Emergency Plan
AAR	After Action Report	CALSTARS	California State Accounting Reporting System
ARC	American Red Cross	CalTRANS	California Department of Transportation
ARP	Accidental Risk Prevention	CBO	Community Based Organization
ATC20	Applied Technology Council20	CD	Civil Defense
ATC21	Applied Technology Council21	CDF	California Department of Forestry and Fire Protection
BCP	Budget Change Proposal	CDMG	California Division of Mines and Geology
BSA	California Bureau of State Audits	CEC	California Energy Commission
CAER	Community Awareness & Emergency Response		
CalARP	California Accidental Release Prevention		
CalBO	California Building Officials		



CEPEC	California Earthquake Prediction Evaluation Council	DPA	California Department of Personnel Administration
CESRS	California Emergency Services Radio System	DPIG	Disaster Preparedness Improvement Grant
CHIP	California Hazardous Identification Program	DR	Disaster Response
CHMIRS	California Hazardous Materials Incident Reporting System	DSA	Division of the State Architect
CHP	California Highway Patrol	DSR	Damage Survey Report
CLETS	California Law Enforcement Telecommunications System	DSW	Disaster Service Worker
CSTI	California Specialized Training Institute	DWR	California Department of Water Resources
CUEA	California Utilities Emergency Association	EAS	Emergency Alerting System
CUPA	Certified Unified Program Agency	EDIS	Emergency Digital Information System
DAD	Disaster Assistance Division (of the state Office of Emergency Svcs)	EERI	Earthquake Engineering Research Institute
DFO	Disaster Field Office	EMA	Emergency Management Assistance
DGS	California Department of General Services	EMI	Emergency Management Institute
DHSRHB	California Department of Health Services, Radiological Health Branch	EMMA	Emergency Managers Mutual Aid
DO	Duty Officer	EMS	Emergency Medical Services
DOC	Department Operations Center	EOC	Emergency Operations Center
DOE	Department of Energy (U.S.)	EOP	Emergency Operations Plan
DOF	California Department of Finance	EPA	Environmental Protection Agency (U.S.)
DOJ	California Department of Justice	EPEDAT	Early Post Earthquake Damage Assessment Tool
		EPI	Emergency Public Information
		EPIC	Emergency Public Information Council

ESC	Emergency Services Coordinator	HMEP	Hazardous Materials Emergency Preparedness
FAY	Federal Award Year	HMGP	Hazard Mitigation Grant Program
FDAA	Federal Disaster Assistance Administration	IDE	Initial Damage Estimate
FEAT	Governor's Flood Emergency Action Team	IA	Individual Assistance
FEMA	Federal Emergency Management Agency	IFG	Individual & Family Grant (program)
FFY	Federal Fiscal Year	IRG	Incident Response Geographic Information System
FIR	Final Inspection Reports	IPA	Information and Public Affairs (of state Office of Emergency Services)
FIRESCOPE	Firefighting Resources of So. Calif Organized for Potential Emergencies	LAN	Local Area Network
FMA	Flood Management Assistance	LEMMA	Law Enforcement Master Mutual Aid
FSR	Feasibility Study Report	LEPC	Local Emergency Planning Committee
FY	Fiscal Year	MARAC	Mutual Aid Regional Advisory Council
GIS	Geographical Information System	MHID	Multihazard Identification
HAZMAT	Hazardous Materials	MOU	Memorandum of Understanding
HAZMIT	Hazardous Mitigation	NBC	Nuclear, Biological, Chemical
HAZUS	Hazards United States (an earthquake damage assessment prediction tool)	NEMA	National Emergency Management Agency
HAD	Housing and Community Development	NEMIS	National Emergency Management Information System
HEICS	Hospital Emergency Incident Command System	NFIP	National Flood Insurance Program
HEPG	Hospital Emergency Planning Guidance	NOAA	National Oceanic and Atmospheric Association
HIA	Hazard Identification and Analysis Unit		

NPP	Nuclear Power Plant	RADEF	Radiological Defense (program)
NSF	National Science Foundation	RAMP	Regional Assessment of Mitigation Priorities
NWS	National Weather Service	RAPID	Railroad Accident Prevention & Immediate Deployment
OA	Operational Area	RDO	Radiological Defense Officer
OASIS	Operational Area Satellite Information System	RDMHC	Regional Disaster Medical Health Coordinator
OCC	Operations Coordination Center	REOC	Regional Emergency Operations Center
OCD	Office of Civil Defense	REPI	Reserve Emergency Public Information
OEP	Office of Emergency Planning	RES	Regional Emergency Staff
OES	California Governor's Office of Emergency Services	RIMS	Response Information Management System
OSHPD	Office of Statewide Health Planning and Development	RMP	Risk Management Plan
OSPR	Oil Spill Prevention and Response	RPU	Radiological Preparedness Unit (OES)
PA	Public Assistance	RRT	Regional Response Team
PC	Personal Computer	SAM	State Administrative Manual
PDA	Preliminary Damage Assessment	SARA	Superfund Amendments & Reauthorization Act
PIO	Public Information Office	SAVP	Safety Assessment Volunteer Program
POST	Police Officer Standards and Training	SBA	Small Business Administration
PPA/CA	Performance Partnership Agreement/Cooperative Agreement (FEMA)	SCO	California State Controller's Office
PSA	Public Service Announcement	SEMS	Standardized Emergency Management System
PTAB	Planning and Technological Assistance Branch		
PTR	Project Time Report		
RA	Regional Administrator (OES)		

SEPIC	State Emergency Public Information Committee
SLA	State and Local Assistance
SONGS	San Onofre Nuclear Generating Station
SOP	Standard Operating Procedure
SWEPC	Statewide Emergency Planning Committee
TEC	Travel Expense Claim
TRU	Transuranic
TTT	Train the Trainer
UPA	Unified Program Account
UPS	Uninterrupted Power Source
USAR	Urban Search and Rescue
USGS	United States Geological Survey
WC	California State Warning Center
WAN	Wide Area Network
WIPP	Waste Isolation Pilot Project

Source: Disaster Management Area D Coordinator, 2004.



# **Appendix E**

## Glossary



## Appendix E: Glossary

Acceleration	The rate of change of velocity with respect to time. Acceleration due to gravity at the earth's surface is 9.8 meters per second squared. That means that every second that something falls toward the surface of earth its velocity increases by 9.8 meters per second.	Building	A structure that is walled and roofed, principally above ground and permanently affixed to a site. The term includes a manufactured home on a permanent foundation on which the wheels and axles carry no weight.
Asset	Any manmade or natural feature that has value, including, but not limited to people; buildings; infrastructure like bridges, roads, and sewer and water systems; lifelines like electricity and communication resources; or environmental, cultural, or recreational features like parks, dunes, wetlands, or landmarks.	Coastal High Hazard Area	Area, usually along an open coast, bay, or inlet, that is subject to inundation by storm surge and, in some instances, wave action caused by storms or seismic sources.
Base Flood	Flood that has a 1 percent probability of being equaled or exceeded in any given year. Also known as the 100-year flood.	Coastal Zones	The area along the shore where the ocean meets the land as the surface of the land rises above the ocean. This land/water interface includes barrier islands, estuaries, beaches, coastal wetlands, and land areas having direct drainage to the ocean.
Base Flood Elevation (BFE)	Elevation of the base flood in relation to a specified datum, such as the National Geodetic Vertical Datum of 1929. The Base Flood Elevation is used as the standard for the National Flood Insurance Program.	Community Rating System (CRS)	An NFIP program that provides incentives for NFIP communities to complete activities that reduce flood hazard risk. When the community completes specified activities, the insurance premiums of policyholders in these communities are reduced.
Bedrock	The solid rock that underlies loose material, such as soil, sand, clay, or gravel.		



Computer-Aided Design And Drafting (CADD)	A computerized system enabling quick and accurate electronic 2-D and 3-D drawings, topographic mapping, site plans, and profile/cross-section drawings.	Earthquake	A sudden motion or trembling that is caused by a release of strain accumulated within or along the edge of earth's tectonic plates.
Contour	A line of equal ground elevation on a topographic (contour) map.	Erosion	Wearing away of the land surface by detachment and movement of soil and rock fragments, during a flood or storm or over a period of years, through the action of wind, water, or other geologic processes.
Critical Facility	Facilities that are critical to the health and welfare of the population and that are especially important following hazard events. Critical facilities include, but are not limited to, shelters, police and fire stations, and hospitals.	Erosion Hazard Area	Area anticipated to be lost to shoreline retreat over a given period of time. The projected inland extent of the area is measured by multiplying the average annual long-term recession rate by the number of years desired.
Debris	The scattered remains of assets broken or destroyed in a hazard event. Debris caused by a wind or water hazard event can cause additional damage to other assets.	Essential Facility	Elements that are important to ensure a full recovery of a community or state following a hazard event. These would include: government functions, major employers, banks, schools, and certain commercial establishments, such as grocery stores, hardware stores, and gas stations.
Digitize	To convert electronically points, lines, and area boundaries shown on maps into x, y coordinates (e.g., latitude and longitude, universal transverse mercator (UTM), or table coordinates) for use in computer applications.	Extent	The size of an area affected by a hazard or hazard event.
Displacement Time	The average time (in days) which the building's occupants typically must operate from a temporary location while repairs are made to the original building due to damages resulting from a hazard event.		
Duration	How long a hazard event lasts.		

Extratropical Cyclone	Cyclonic storm events like Nor'easters and severe winter low-pressure systems. Both West and East coasts can experience these non-tropical storms that produce gale-force winds and precipitation in the form of heavy rain or snow. These cyclonic storms, commonly called Nor'easters on the East Coast because of the direction of the storm winds, can last for several days and can be very large – 1,000-mile wide storms are not uncommon.	Fire Potential Index (FPI)	Developed by USGS and USFS to assess and map fire hazard potential over broad areas. Based on such geographic information, national policy makers and on-the-ground fire managers established priorities for prevention activities in the defined area to reduce the risk of managed and wildfire ignition and spread. Prediction of fire hazard shortens the time between fire ignition and initial attack by enabling fire managers to pre-allocate and stage suppression forces to high fire risk areas.
Fault	A fracture in the continuity of a rock formation caused by a shifting or dislodging of the earth's crust, in which adjacent surfaces are differentially displaced parallel to the plane of fracture.	Flash Flood	A flood event occurring with little or no warning where water levels rise at an extremely fast rate.
Federal Emergency Management Agency (FEMA)	Independent agency created in 1978 to provide a single point of accountability for all Federal activities related to disaster mitigation and emergency preparedness, response and recovery.	Flood	A general and temporary condition of partial or complete inundation of normally dry land areas from (1) the overflow of inland or tidal waters, (2) the unusual and rapid accumulation or runoff of surface waters from any source, or (3) mudflows or the sudden collapse of shoreline land.
		Flood Depth	Height of the floodwater surface above the ground surface.
		Flood Elevation	Elevation of the water surface above an established datum, e.g. National Geodetic Vertical Datum of 1929, North American Vertical Datum of 1988, or Mean Sea Level.

Flood Hazard Area	The area shown to be inundated by a flood of a given magnitude on a map.	Fujita Scale of Tornado Intensity	Rates tornadoes with numeric values from F0 to F5 based on tornado wind-speed and damage sustained. An F0 indicates minimal damage such as broken tree limbs or signs, while and F5 indicated severe damage sustained.
Flood Insurance Rate Map (FIRM)	Map of a community, prepared by the Federal Emergency Management Agency that shows both the special flood hazard areas and the risk premium zones applicable to the community.	Functional Downtime	The average time (in days) during which a function (business or service) is unable to provide its services due to a hazard event.
Flood Insurance Study (FIS)	A study that provides an examination, evaluation, and determination of flood hazards and, if appropriate, corresponding water surface elevations in a community or communities.	Geographic Area Impacted	The physical area in which the effects of the hazard are experienced.
Floodplain	Any land area, including watercourse, susceptible to partial or complete inundation by water from any source.	Geographic Information Systems (GIS)	A computer software application that relates physical features on the earth to a database to be used for mapping and analysis.
Frequency	A measure of how often events of a particular magnitude are expected to occur. Frequency describes how often a hazard of a specific magnitude, duration, and/or extent typically occurs, on average. Statistically, a hazard with a 100-year recurrence interval is expected to occur once every 100 years on average, and would have a 1 percent chance – its probability – of happening in any given year. The reliability of this information varies depending on the kind of hazard being considered.	Ground Motion	The vibration or shaking of the ground during an earthquake. When a fault ruptures, seismic waves radiate, causing the ground to vibrate. The severity of the vibration increases with the amount of energy released and decreases with distance from the causative fault or epicenter, but soft soils can further amplify ground motions



Hazard	A source of potential danger or adverse condition. Hazards in this how to series will include naturally occurring events such as floods, earthquakes, tornadoes, tsunamis, coastal storms, landslides, and wildfires that strike populated areas. A natural event is a hazard when it has the potential to harm people or property.	Hurricane	An intense tropical cyclone, formed in the atmosphere over warm ocean areas, in which wind speeds reach 74-miles-per-hour or more and blow in a large spiral around a relatively calm center or "eye." Hurricanes develop over the north Atlantic Ocean, northeast Pacific Ocean, or the south Pacific Ocean east of 160°E longitude. Hurricane circulation is counter-clockwise in the Northern Hemisphere and clockwise in the Southern Hemisphere.
Hazard Event	A specific occurrence of a particular type of hazard.		
Hazard Identification	The process of identifying hazards that threaten an area.		
Hazard Mitigation	Sustained actions taken to reduce or eliminate long-term risk from hazards and their effects.	Hydrology	The science of dealing with the waters of the earth. A flood discharge is developed by a hydrologic study.
Hazard Profile	A description of the physical characteristics of hazards and a determination of various descriptors including magnitude, duration, frequency, probability, and extent. In most cases, a community can most easily use these descriptors when they are recorded and displayed as maps.	Infrastructure	Refers to the public services of a community that have a direct impact on the quality of life. Infrastructure includes communication technology such as phone lines or Internet access, vital services such as public water supplies and sewer treatment facilities, and includes an area's transportation system such as airports, heliports; highways, bridges, tunnels, roadbeds, overpasses, railways, bridges, rail yards, depots; and waterways, canals, locks, seaports, ferries, harbors, drydocks, piers and regional dams.
HAZUS (Hazards U.S.)	A GIS-based nationally standardized earthquake loss estimation tool developed by FEMA.		

Intensity	A measure of the effects of a hazard event at a particular place.	Mitigation Plan	A systematic evaluation of the nature and extent of vulnerability to the effects of natural hazards typically present in the state and includes a description of actions to minimize future vulnerability to hazards.
Landslide	Downward movement of a slope and materials under the force of gravity.		
Lateral Spreads	Develop on gentle slopes and entail the sidelong movement of large masses of soil as an underlying layer liquefies in a seismic event. The phenomenon that occurs when ground shaking causes loose soils to lose strength and act like viscous fluid. Liquefaction causes two types of ground failure: lateral spread and loss of bearing strength.	National Flood Insurance Program (NFIP)	Federal program created by Congress in 1968 that makes flood insurance available in communities that enact minimum floodplain management regulations in 44 CFR §60.3.
Liquefaction	Results when the soil supporting structures liquefies. This can cause structures to tip and topple.	National Geodetic Vertical Datum of 1929 (NGVD)	Datum established in 1929 and used in the NFIP as a basis for measuring flood, ground, and structural elevations, previously referred to as Sea Level Datum or Mean Sea Level. The Base Flood Elevations shown on most of the Flood Insurance Rate Maps issued by the Federal Emergency Management Agency are referenced to NGVD.
Lowest Floor	Under the NFIP, the lowest floor of the lowest enclosed area (including basement) of a structure.	National Weather Service (NWS)	Prepares and issues flood, severe weather, and coastal storm warnings and can provide technical assistance to Federal and state entities in preparing weather and flood warning plans.
Magnitude	A measure of the strength of a hazard event. The magnitude (also referred to as severity) of a given hazard event is usually determined using technical measures specific to the hazard.	Nor'easter	An extra-tropical cyclone producing gale-force winds and precipitation in the form of heavy snow or rain.

Outflow	Follows water inundation creating strong currents that rip at structures and pound them with debris, and erode beaches and coastal structures.	Richter Scale	A numerical scale of earthquake magnitude devised by seismologist C.F. Richter in 1935.
Planimetric	Describes maps that indicate only man-made features like buildings.	Risk	The estimated impact that a hazard would have on people, services, facilities, and structures in a community; the likelihood of a hazard event resulting in an adverse condition that causes injury or damage. Risk is often expressed in relative terms such as a high, moderate or low likelihood of sustaining damage above a particular threshold due to a specific type of hazard event. It also can be expressed in terms of potential monetary losses associated with the intensity of the hazard.
Planning	The act or process of making or carrying out plans; the establishment of goals, policies and procedures for a social or economic unit.		
Probability	A statistical measure of the likelihood that a hazard event will occur.		
Recurrence Interval	The time between hazard events of similar size in a given location. It is based on the probability that the given event will be equaled or exceeded in any given year.	Riverine	Of or produced by a river.
Repetitive Loss Property	A property that is currently insured for which two or more National Flood Insurance Program losses (occurring more than ten days apart) of at least \$1000 each have been paid within any 10-year period since 1978.	Scale	A proportion used in determining a dimensional relationship; the ratio of the distance between two points on a map and the actual distance between the two points on the earth's surface.
Replacement Value	The cost of rebuilding a structure. This is usually expressed in terms of cost per square foot, and reflects the present-day cost of labor and materials to construct a building of a particular size, type and quality.	Scarp	A steep slope.
		Scour	Removal of soil or fill material by the flow of floodwaters. The term is frequently used to describe storm-induced, localized conical erosion around pilings and other foundation supports where the obstruction of flow increases turbulence.



Seismicity	Describes the likelihood of an area being subject to earthquakes.	Substantial Damage	Damage of any origin sustained by a structure in a Special Flood Hazard Area whereby the cost of restoring the structure to its before-damaged condition would equal or exceed 50 percent of the market value of the structure before the damage.
Special Flood Hazard Area (SFHA)	An area within a floodplain having a 1 percent or greater chance of flood occurrence in any given year (100-year floodplain); represented on Flood Insurance Rate Maps by darkly shaded areas with zone designations that include the letter A or V.	Super Typhoon	A typhoon with maximum sustained winds of 150 mph or more.
Stafford Act	The Robert T. Stafford Disaster Relief and Emergency Assistance Act, PL 100-107 was signed into law November 23, 1988 and amended the Disaster Relief Act of 1974, PL 93-288. The Stafford Act is the statutory authority for most Federal disaster response activities, especially as they pertain to FEMA and its programs.	Surface Faulting	The differential movement of two sides of a fracture – in other words, the location where the ground breaks apart. The length, width, and displacement of the ground characterize surface faults.
State Hazard Mitigation Officer (SHMO)	The representative of state government who is the primary point of contact with FEMA, other state and Federal agencies, and local units of government in the planning and implementation of pre- and post-disaster mitigation activities.	Tectonic Plate	Torsionally rigid, thin segments of the earth's lithosphere that may be assumed to move horizontally and adjoin other plates. It is the friction between plate boundaries that cause seismic activity.
Storm Surge	Rise in the water surface above normal water level on the open coast due to the action of wind stress and atmospheric pressure on the water surface.	Topographic	Characterizes maps that show natural features and indicate the physical shape of the land using contour lines. These maps may also include manmade features.
Structure	Something constructed. (See also Building)	Tornado	A violently rotating column of air extending from a thunderstorm to the ground.

Tropical Cyclone	A generic term for a cyclonic, low-pressure system over tropical or subtropical waters.	Vulnerability	Describes how exposed or susceptible to damage an asset is. Vulnerability depends on an asset's construction, contents, and the economic value of its functions. Like indirect damages, the vulnerability of one element of the community is often related to the vulnerability of another. For example, many businesses depend on uninterrupted electrical power – if an electric substation is flooded, it will affect not only the substation itself, but a number of businesses as well. Often, indirect effects can be much more widespread and damaging than direct ones.
Tropical Depression	A tropical cyclone with maximum sustained winds of less than 39 mph.		
Tropical Storm	A tropical cyclone with maximum sustained winds greater than 39 mph and less than 74 mph.		
Tsunami	Great sea wave produced by submarine earth movement or volcanic eruption.		
Typhoon	A special category of tropical cyclone peculiar to the western North Pacific Basin, frequently affecting areas in the vicinity of Guam and the North Mariana Islands. Typhoons whose maximum sustained winds attain or exceed 150 mph are called super typhoons.	Vulnerability Assessment	The extent of injury and damage that may result from a hazard event of a given intensity in a given area. The vulnerability assessment should address impacts of hazard events on the existing and future built environment.
		Water Displacement	When a large mass of earth on the ocean bottom sinks or uplifts, the column of water directly above it is displaced, forming the tsunami wave. The rate of displacement, motion of the ocean floor at the epicenter, the amount of displacement of the rupture zone, and the depth of water above the rupture zone all contribute to the intensity of the tsunami.

Wave Runup	The height that the wave extends up to on steep shorelines, measured above a reference level (the normal height of the sea, corrected to the state of the tide at the time of wave arrival).
Wildfire	An uncontrolled fire spreading through vegetative fuels, exposing and possibly consuming structures.
Zone	A geographical area shown on a Flood Insurance Rate Map (FIRM) that reflects the severity or type of flooding in the area.

Source: Disaster Management Area D Coordinator, 2004.

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