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IA 0 – Oregon Hazard Identification and Risk Assessment

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1 Introduction

A hazard, whether natural or technological, is an extreme event that adversely impacts human life, property, or activity. No human settlements are free from the risk of hazards; therefore, it is vital that researchers and decision makers have access to all available hazard information. Information needs are especially acute as we contemplate rising tolls from hazards worldwide.

During the last 25 years, the U.S. has experienced many of the costliest and most disruptive crises in its history, including the Three Mile Island nuclear plant accident, the Mount St. Helens eruption, Hurricanes Hugo and Andrew, major flooding in the Midwest, and the Loma Prieta and Northridge earthquakes. The pattern has been much the same worldwide, with events such as Bhopal, Chernobyl, and the Mexico City and Kobe earthquakes.

This same period has seen significant changes in emergency management policies and programs and the introduction of new technologies and crisis management strategies. Among these are the creation of the Federal Emergency Management Agency (FEMA), the development of the Federal Response framework, the passage of new legislation such as Title III of the Superfund Amendments and Reauthorization Act of 1986, the growing professionalization of the field of emergency management, and the advent of the computer revolution.

Research on emergency preparedness and response has typically been both event and problem driven. Major emergencies and disasters also present good research opportunities; knowledge increases as activities, impacts, and issues are studied across different disasters and different communities. The last two and a half decades have been marked by exponential growth in the amount of empirical data available, increased methodological sophistication, and important conceptual and theoretical advances.

Regardless of their scale, recent disasters have focused the attention of government officials and citizens alike on the economic, human and environmental costs. With each new event, it becomes more apparent that a unified, concerted approach to lessening, if not eliminating, the risk is needed.

In response to the increasing threat of both the natural and the technological hazards, the challenge to the community is to halt or reverse the trend of rising impacts. Experience suggests that enough knowledge already exists, if properly applied, to substantially reduce both human and property losses from disasters. An important first step in this process is identifying natural and technological hazards and assessing associated risks.

OHS (Oregon Hazard Summary) is intended to answer some of the issues communities in Oregon are interested in, regarding the threats they are facing and what mitigation tools are available. This report summarizes the state of scientific and technical knowledge on identification of hazards and the risks that have been or can be assigned to each hazard. OHS cannot, however, solve the puzzle for the

local communities. It rests with each neighborhood and each local community in Oregon to identify their potential hazards, determine their vulnerability to those hazards, and take proper preparedness and mitigation actions. OHS is meant to serve as a helpful guide and support for the local communities in understanding of hazards and their impacts on people and the built environment, in conducting their hazard analysis and adopting proper risk strategies.

Oregon Emergency Management intends to update this report as identification, assessment, and mitigation approaches are refined. Depending on the perspective, priorities, and experience, of each local community, the information contained in OHS will have varying applicability to their efforts. We urge the local communities to utilize the information that is relevant to them and to use OHS as an evolving tool in their disaster mitigation efforts.

2 History

Oregon has an area of 97,060 square miles and consists of 36 counties with 242 cities. The population, according to the 2005 online edition of the Oregon Blue Book, is 3,631,440.

The State of Oregon is exposed to three categories of hazards, natural, terrorism and technological (man-made). These hazards generate a spectrum of potential emergencies or disasters that pose risks to the lives and properties of citizens and visitors.

Listed below are the major hazardous events recorded in Oregon since the early 1800's:

Table 1 Chronology of Emergency/Disaster Events for the State of Oregon

Date	Event
1811	First recorded ship disaster (Tonquin), lost 5 men.
1846	Flood swept away Syracuse (Marion County).
1853 Jan. 1	Willamette Valley Flood – heavy rain and snow.
1855 Dec. 29	New statehouse archives library of territory destroyed by fire.
1855 Dec. 31	First Capitol destroyed by fire.
1861 Dec.	Massive flooding throughout Oregon.
1868 Oct. 26	Forest fire covered in and around Port Orford area.
1868 Aug. 13	Great earthquake in South America felt on coast of Benton County in form of a tidal wave at Yaquina Bay.
1872 Nov. 14	Earthquake in Pacific Northwest (M 7.4)
1872 Dec. 22	Fire in Portland destroyed 3 blocks, 5 brick and 15 wooden buildings.
1873 Aug. 2	Fire in Portland destroyed 22 block area of Portland Business District.
1873 Nov. 22	Earthquake in Portland Orford (M 6.7)
1877 Oct. 12	Earthquake in Portland (M 5.2)
1881 Nov. 5	Severe windstorm in Union, considerable damage.

Table 1 Chronology of Emergency/Disaster Events for the State of Oregon

Date	Event
1891 May 25	Arlington hit by cyclone.
1892	Monastery and college destroyed by fire.
1894 Jun.	"1894 Flood" occurred in June at Bonneville, downtown flooded (2 weeks).
1894 Dec. 24	Silver Lake fire, 43 lives lost.
1898	Frame courthouse in Polk County destroyed by fire.
1903 Jun. 14	Heppner flood, 250 people killed or drowned.
1907 Feb. 11	Arlington experienced bad flooding.
1910 May 15	Bonanza business district fire.
1912 Feb. 12	Fire in Redmond destroyed newspaper plant, the Redmond Spokesman.
1913 Aug. 18	Bonanza business district, second big fire.
1914 Jun. 11	Fire destroyed much of Bandon District.
1914	Fire destroyed post office building in Bonanza.
1920 Jul. 6	Fire destroyed Pioneer Garage, Central, OR. Motors, Band Stand, and Moose Lodge.
1920 Sep. 1	Houston hotel fire in Klamath.
1922 Jun. 1	Fire destroyed Prineville schoolhouse and major sections of downtown.
1922 Dec. 8	Fire destroyed business district of Astoria.
1923	Grand hotel fire in Arlington destroyed city hall, fire station and numerous businesses.
1927	Fire destroyed college and abbey at Mount Angel.
1927	Arlington hit by flash flood.
1930 May 30	Bonanza fire destroyed bank, post office, restaurant, grocery and blacksmith.
1933 Feb. 10	Lowest record temperature, -54 º F in Seneca.
1933 Jun. 12	Willamette River rose to 24.9 ft.
1933 Aug. 14	Tillamook Burn destroyed 240,000 acres of timber.
1935 Apr. 25	Second state capitol destroyed by fire.
1936 Jul. 16	Earthquake in Milton Freewater (M 6.1).
1936 Sep. 26	Forest fire nearly destroyed Bandon, 11 deaths, 1500 homeless.
1938 Aug. 10	Highest Record Temperature, 119 º F in Pendleton.
1942	First Civil Defense Program established in the City of Portland.
1948 May 30	Flood destroyed Vanport, 14 deaths, 5500 homeless.
1949 Apr. 13	Earthquake, Northern Oregon.
1954	Fire destroyed brick courthouse in Condon.
1959 Aug. 7	Dynamite truck exploded in Roseburg, 12 deaths, 35 blocks destroyed.
1962 Oct. 12	Columbus Day Storm, strong winds, extensive damage, 24 deaths.
1962 Nov. 5	Earthquake in Portland (M 5.2).

Table 1 Chronology of Emergency/Disaster Events for the State of Oregon

Date	Event
1964 Dec. 21	Northwest Floods (Christmas Flood), 7 deaths.
1979 Dec.	Severe winter ice storm, damage throughout Willamette Valley.
1980 May 18*	Mt. St. Helens erupts in Southwest Washington.
1985	Driest year on record for Oregon.
1987 Aug. 30	Largest fire in modern Southern Oregon history charring about 35% of the Kalmiopsis wilderness (200,000 acres).
1988 Aug. 4	Major transportation accident on interstate highway, 7 deaths, 37 injuries.
1990 Aug. 4	Awbrey Hall Fire, 3353 acres, $9 million in damage, $2 million in suppression costs.
1990 Jan.*	Severe winter storm, flooding in Tillamook and Clatsop Counties.
1991 Apr. 9	Landslide caused $5 million in damage along Wilson River Highway.
1991 Oct.	Multnomah Falls Forest Fire.
1993 Mar.	Malheur County Floods.
1993 Mar. 25*	Earthquake in Scotts Mills (M 5.7).
1993 Apr.	Severe weather in Curry County, Highway 101 landslide.
1993 Sep. 20*	Earthquake in Klamath Falls (M 6.0).
1994 May*	'El Niño', drought caused a salmon fishing disaster, State-wide drought disaster.
1995 May	Wildland fire in Deschutes County.
1995 Jul. 8-9*	Severe storm, flash flooding in northern Central Oregon (Wasco County).
1995 Nov.	Severe weather caused landslides and obstruction of highways in Northwest.
1995 Dec.	Severe storm, high winds and heavy rain in Western Oregon – power failure.
1996 Feb.*	Flood emergency in 27 counties.
1996 Nov.*	Flood and landslides in Western Oregon.
1997 Jan.*	Severe weather, flood and landslides in 25 counties.
1998 Jun.*	Oregon flooding.
2002 Mar.*	Severe winter storms with high winds, ice and snow.
2004 Feb.*	Severe winter storms.
2006 Mar.*	Severe storms, flooding, landslides and mudslides.
2006 Dec.*	Severe storms, flooding, landslides and mudslides.
2007 Feb.*	Severe winter storms and flooding.

* *Represents a presidentially declared disaster. Prior to 1950, Presidential Disaster Declarations were not issued.*

3 Specific Hazards and Their Distinctive Features

Information on specific hazards is provided in the following additional Incident Annexes to the State EOP:

Table 2 State of Oregon EOP Incident Annexes

Annex	Hazards Included
IA 1	Drought
IA 2	Earthquake
IA 3	Flood, including: ▪ Dam/Levee Failure
IA 4	Tsunami
IA 5	Wildland Fire
IA 6	Volcano
IA 7	Severe Weather, including: ▪ Thunderstorm and Lightning ▪ Tornado ▪ Windstorm ▪ Hailstorm ▪ Snow Avalanche ▪ Severe Winter Storm
IA 8	Terrorism

4 National Mitigation Strategy and Goal

As a result of the disasters of the early 1990s, in particular the Midwest floods of 1993, the U.S. Congress directed FEMA to place its highest priority on working with state and local agencies to mitigate the impacts of future natural hazard events. This marked a fundamental shift in policy: rather than placing primary emphasis on response and recovery, FEMA's focus broadened to incorporate mitigation as the foundation of emergency management.

FEMA derived 10 fundamental principals for the framework and objectives of the National Mitigation Strategy:

- Risk reduction measures ensure long-term economic success for the community as a whole rather than short-term benefits for special interests.
- Risk reduction measures for one natural hazard must be compatible with risk reduction measures for other natural hazards.
- Risk reduction measures must be evaluated to achieve the best mix for a given location.

- Risk reduction measures for natural hazards must be compatible with risk reduction measures for technological hazards and vice versa.
- All mitigation is local.
- Disaster costs and the impacts of natural hazards can be reduced by emphasizing pro-active mitigation before emergency response; both pre-disaster (preventive) and post-disaster (corrective) mitigation is needed.
- Hazard identification and risk assessment are the cornerstones of mitigation.
- Building new federal-state-local partnerships and public-private partnerships is the most effective means of implementing measures to reduce the impacts of natural hazards.
- Those who knowingly choose to assume greater risk must accept responsibility for that choice.
- Risk reduction measures for natural hazards must be compatible with the protection of natural and cultural resources.

Using these principles as guidance, FEMA established a National Mitigation Goal to be accomplished by the year 2010. The two components of the goal are (1) to substantially increase public awareness of natural hazard risk so that the public demands safer communities in which to live and work and (2) to significantly reduce the risk of loss of life, injuries, economic costs, and destruction of natural and cultural resources that result from natural hazards.

5 Hazard Vulnerability Assessment

5.1 Methodology

It is usually difficult, and many times impossible, to predict the occurrence of a particular hazard. Lack of a long historical record, as well as the irregular nature of most hazards, make it difficult to establish a repetitive pattern. Moreover, scientific research has not yet reached the point where hazard prediction can be done with a high degree of accuracy. Conducting a hazard analysis, though a very useful first step in emergency preparedness, is still dependant on factors that are partly or totally unknown. It is not an exact science and there is no one accepted method of conducting a hazard analysis.

Several methods have been used to quantify the vulnerability of a community to various hazards. Just like a complicated equation system with several unknown variables is solved by assuming some of them and finding the others, so do hazard analysis methods assume some parameters to define a functional relationship.

This approach will allow the user to arrive at some conclusions regarding the relative prioritization of hazards.

A few questions need to be asked when performing a hazard analysis: *What hazards can we expect in this community? Is there a history of these hazards? How vulnerable is the community to them? What is the probability of another occurrence in the near future? What is the worst scenario that could happen? What can be done to prevent the catastrophic effects?* A hazard analysis is, simply, finding answers to these questions.

The method that follows was applied in Oregon in 1984 and 1996 to conduct the hazard analysis. It provides the local jurisdictions with a sense of hazard priorities, or relative risk. It does not predict the occurrence of a hazard, but it can quantify the risk of one hazard compared with another. By doing this analysis, planning can be focused where the risk is greatest.

The method takes into account four features: history, vulnerability, probability, and maximum threat. To help compare the various hazards against one another, two rating factors are used: weight and severity of risk.

5.2 Weight Factor

The weight factor differentiates the four features mentioned before according to how important they are in forecasting a disaster or emergency and determining its effects.

The initiators of this method allocated history, vulnerability, probability and maximum threat weight factors equal to 2,5,7, and 10, respectively.

History (weight factor = 2) is determined by the record of occurrences of previous major emergencies or disasters for a particular hazard in the particular geographic area. Examples of situations included in assessing the history of a hazard are events for which the following types of activities are required

- activation of the emergency operations center (EOC) or alternative EOC;
- activation/implementation of three or more emergency operations plan (EOP) functions (Alert & Warning, Evacuation, Shelter, etc.);
- a multijurisdictional response;
- response coordinated by a unified command structure;
- local declaration of emergency.

Vulnerability (weight factor = 5) is determined by the percentage of population and property likely to be affected.

Probability (weight factor = 7) is determined by the likelihood of occurrence within a certain length of time.

Maximum Threat (weight factor = 10) is reflected in the maximum percentage of population and property that could be affected under a worst-case scenario.

5.3 Severity of Risk

The severity of risk is measured at each of the four features. The risk is classified as low, medium, or high and is allocated quantifying points (to be applied to each of the four features).

Rating	Factor
Low	1 – 3 points
Medium	4 – 6 points
High	7 – 10 points

The following landmarks are considered in determining the severity of risk factor:

History. The record of occurrences of previous major emergencies of disasters.

Rating	Factor
Low	0 – 1 event per 100 years
Medium	2 – 3 events per 100 years
High	4+ events per 100 years

Vulnerability. The percentage of population and property likely to be affected.

Rating	Factor
Low	<1% affected
Medium	1 – 10% affected
High	>10% affected

Probability. The likelihood of occurrence within a special period of time.

Rating	Factor
Low	>1 chance per 100 years
Medium	>1 chance per 50 years
High	> 1 chance per 10 years

Maximum Threat. The maximum percentage of population and property that could be affected under a worst case scenario.

Rating	Factor
Low	<5% affected
Medium	5 – 25% affected
High	>25% affected

Using the four features along with their weight and severity of risk factors, it is possible to calculate a score for a particular hazard. By multiplying the severity rating by the weight factor associated with each feature, a subscore can be determined. For example, knowing the history of that hazard to be high (over four events recorded within the last 100 years), we can determine the subscore for history:

2 (weight factor) X 10 (severity of risk) = 20.

Likewise, subscores for vulnerability (Ex.: 5X10=50), probability (Ex.: 7X10=70), and maximum threat (Ex.: 10X10=100). Adding the subscores will result in a total score for that hazard:

20 + 50 + 70 + 100 = 240.

When several hazards are taken into consideration, the results of this analysis can be displayed into a matrix. Following is an example of a hazard analysis matrix.

Table 3 Sample Hazard Analysis Matrix

Sample Jurisdiction	History	Vulnerability	Probability	Maximum Threat	Total Risk
Hazard/Weight Factor	2	5	7	10	-
Hazardous Materials	2X10 (H)=20	5X10 (H)=50	7X10 (H)=70	10X10 (H)=100	240
Flood	2X10 (H)=20	5X1 (L)=5	7X10 (H)=70	10X5 (M)=50	145
Dam Failure	2X1 (L) =2	5X10 (H)=50	7X1 (L)=7	10X10 (H)=100	159
Earthquake	2X1 (L)=2	5X10 (H)=50	7X1 (L)=7	10X10 (H)=100	159
Wildland Fire	2X10 (H)=20	5X1 (L)=5	7X10 (H)=70	10X5 (M)=50	145

The total score for one hazard isn't as important as it is the way it compares with other hazards the jurisdiction faces. By comparing scores, the jurisdiction can determine which hazard is more significant for them and what priorities are in emergency management preparation.

5.4 Application for Hazard Areas in Oregon

The method described above was used by the local jurisdictions in Oregon in 1984 and then again in 1995-1996. Most of the Oregon jurisdictions have completed a hazard analysis, following the presented model, in either 1984 or 1996, and many of them completed it on both times.

Because this study is a qualitative analysis rather than a quantitative one, the data that follows does not include the scores reached by the local jurisdictions as shown in Table 4. Instead, it presents the order of hazards, that is, how they were rated by the local communities. Indeed, for the purpose of this study, we are not so much interested in how many points a certain hazard has scored in a local jurisdiction, but rather in the ranking of that hazard. This approach is more effective, given the subjectivity of the hazard analysis method used and the emotional factor that could have played a role when the hazards were assessed by the local jurisdictions.

Table 4 Results and Comments on 1996 Hazard Analysis Charts

COUNTY\HAZARD	FLOOD	EQ	TSUNAMI	FIRE	DROUGHT	WEATHER	VOLCANO	DAM FAIL	LANDSLIDE	HAZMAT	TRANSP	CIVIL DIS	UTILITY	NUCLEAR	ATTACK	INFEST
BAKER	1	3				5		3			2					
BEAVERTON	1					3				1	4					
BENTON	2					1		3		5				4		
CLACKAMAS	1	6		4		1	6		6		5		1			
CLATSOP																
COLUMBIA	5					1		4		3				1		
COOS	1		6	1		1				1	1					
CROOK	2	5		7	3	1		4			6					
CURRY	3		2	5		1					4					
DESCHUTES	4			2		1				3						
DOUGLAS	3				2	4			5	1						
GILLIAM	3			6		1				5	3		1			
GRANT	1	3				1				4						
GRESHAM		4				1	4		4		3	7	1			
HARNEY	1			1		1		1		1	1					
HOOD RIVER																
JACKSON	1			1				5		1	4					
JEFFERSON																
JOSEPHINE	1			6	6	1		5		1		8	1			
KLAMATH				2	2	1				5	4					
LAKE	1	4		1		1				5	5					
LANE	3	4				1		4		2						
LINCOLN	5	3	3	6		1				6			1			
LINN																
MALHEUR																
MARION																
MORROW	6			1		1		5		3	3					
MULTNOMAH		5		1		1				1	1					
POLK	3					1		4					2			
PORTLAND	5	1				1			1	4						
SHERMAN				6	3	1				4	4		1			
TILLAMOOK																
UMATILLA	1	4				1		5		3						
UNION	6			4		1			5	1	1					
WALLOWA																
WASCO	5	4				3				1	1					
WASHINGTON	6	4			3	1	4			6			1			
WHEELER	1			1	1	4					5					
YAMHILL	3	7				1		3		3	3		1			
Nr. occurences	27	14	3	17	20	30	3	12	5	24	19	2	9	2		
Average rank	2.78	4.07	3.67	3.24	2.86	1.47	4.67	3.83	4.2	2.92	3.16	7.5	1.11	2.5		
Final rank	**4**	**11**	**9**	**8**	**5**	**2**	**13**	**10**	**12**	**6**	**7**	**14**	**1**	**3**		

The hazards taken into consideration were: flood, earthquake, tsunami, fire, drought, severe weather, volcano, dam failure, landslide, hazardous material incidents, transportation accidents, civil disturbance, utility failure, nuclear incident, enemy attack and infestation. The previous table shows how each of these hazards was rated by the participating local jurisdictions in Oregon. It also provides some overall information, such as the number of occurrences, that is, how many times a hazard appeared in the classification of the local jurisdictions, the average rank for each hazard, based on how it was rated, and the final rank.

The most significant hazard, according to the 1984 Hazard Analysis Table, is the utility failure, followed by the severe weather and the nuclear incident. However it is worth noting that the third major hazard - the nuclear incident - is only mentioned by two counties, one of which lists it on the first place along with another hazard. Also, utility failure is rarely a hazard by itself - it is usually triggered by another hazard; therefore, the number one ranking of the utility failure is certainly be shadowed by this consideration.

Results and Comments on 1966 Hazard Analysis Charts

This time the chart is “fuller,” as local jurisdictions are listing more hazards than they did in 1984. This made it possible for hazards that were not listed in 1984 to have a ranking of their own, which probably accounts for a more accurate classification. Indeed, because the hazard analysis method presented previously and used by the local jurisdictions focuses on the comparison between hazards, rather than on their prediction, it is expected to produce better results when more hazards are taken into consideration.

Summarizing the hazard analysis performed by the local jurisdictions in 1984 and 1996, severe weather/winter storms, followed by utility/power failure and flood are the three highest-rated hazards. Utility/power failure, however, could be overlooked, as discussed before, because it is rather an effect of another hazard than a hazard by itself.

Also worth noticing is the correlation between various hazards, which, in doing the hazard analysis, makes it difficult to identify a hazard and rate it independently. For example, some hazard analysts rated severe weather very highly on account of some weather-related hazards, such as drought, flood, landslide, or wildland fire. As a result, more points were allocated to severe weather than to other hazards. This partly explains why severe weather/winter storms were rated so highly. With the assumption that all hazards were equally disadvantaged by their intercorrelation, and making allowances for the severe weather, the hazards rated highest by Oregon local jurisdictions would be flood, hazardous material incident, and drought. Earthquake, wildland fire, tsunami, landslide, dam failure, and volcano are also close.

Table 5 1984/1996 Combined State of Oregon Hazard Rankings

COUNTY\HAZARD	FLOOD	EQ	TSUNAMI	FIRE	DROUGHT	WEATHER	VOLCANO	DAM FAIL	LANDSLIDE	HAZMAT	TRANSP	CIVIL DIS	UTILITY	NUCLEAR	ATTACK	INFEST
BAKER	4			5	5	1				1	1					
BEAVERTON	3	2		4		1				5	5			7		
BENTON	3	2		3	9	1	10	11		3		8	6	12	7	
CLACKAMAS	3	5		3		1				2	8	7		6		
CLATSOP	4	1	2	8		7		4	3	6						
COLUMBIA	4	1		6	5	3	8			2	6	8				
COOS	5	1	3	6		2	11	10		9	4	7				8
CROOK																
CURRY	1	7	6	1		1			1				5			
DESCHUTES	3	5		1		1				3						
DOUGLAS	3	7	6	4		1		9		4		8	2			
GILLIAM	1			1	4	3				6			4			
GRANT	2	4		2		1	8	7		5	6					
GRESHAM	8	5			3	1	7			4			2	6		
HARNEY				2	5	3				1	5			3		
HOOD RIVER	3	5		3		1				2	6	7				
JACKSON	5	4		3	7	1	11			2	9	10	6	8		
JEFFERSON																
JOSEPHINE	10	4		1	1	1	8	11	8	5	7	6		12		13
KLAMATH				1	1	1				1	1		1			
LAKE	5	3		9	4	1			12	1	10	11	7	8	6	
LANE	4	1	7	7	1	1		5	10			7		5		
LINCOLN	6	4	2	3		1	7	10		8	5	9				11
LINN	1	2		10		4	5	7	11	9	8		3	12	6	
MALHEUR	1	4			3	2	7			4				6		
MARION	3	1		7		1	8	5			6	4				
MORROW	1			1		1		1		1				1		
MULTNOMAH	3	2	4			1	9			4	4	8		7		10
POLK	5	5		8	1	1	7	10		8	1		1			
PORTLAND	10	4		12		3	6	7	11	1	1	5	8	9		13
SHERMAN																
TILLAMOOK	1	4	3	6		1			5							
UMATILLA	3	6		3		1				3	7	8		2		
UNION	3	5		2		1			6	3	7	8				
WALLOWA																
WASCO																
WASHINGTON	13	3		9	8	1	4	12	10	6	6	11	1	5		
WHEELER																
YAMHILL																
Nr. occurences	30	27	8	29	14	32	15	14	10	28	21	17	12	16	3	5
Average rank	4.03	3.59	4.13	4.52	4.07	1.59	7.73	7.79	7.7	3.89	5.38	7.76	3.83	6.81	6.33	11
Final rank	**5**	**2**	**7**	**8**	**6**	**1**	**13**	**15**	**12**	**4**	**9**	**14**	**3**	**11**	**10**	**16**

Table 6 1984/1994 Hazard Analysis Summary

Rank\Year	1984	1996	1984+1996 Combined
1	Utility/Power Failure	Severe Weather/Winter Storms	Severe Weather/Winter Storms
2	Severe Weather/Winter Storms	Earthquake	Utility/Power Failure
3	Nuclear Incident	Utility/Power Failure	Flood
4	Flood	HazMat	HazMat
5	Drought	Flood	Drought
6	HazMat	Drought	Earthquake
7	Transportation	Tsunami	Nuclear Incident
8	Fire	Fire	Transportation
9	Tsunami	Transportation	Fire
10	Dam Failure	Enemy Attack	Tsunami
11	Earthquake	Nuclear Incident	Enemy Attack
12	Landslide	Landslide	Landslide
13	Volcano	Volcano	Dam Failure
14	Civil Disturbance	Civil Disturbance	Volcano
15		Dam Failure	Civil Disturbance
16		Infestation	Infestation

The reports produced by the local jurisdictions summarize the principal natural and technological threats, or hazards, facing communities and emergency management coordinators. However, the limitations of these rankings should be acknowledged. Some of the limiting factors are the wide variation in application of criteria to the same hazards, differences between regional impacts of particular hazards, applicability of threats from region to region, and variances in amounts and types collected on particular hazards.

6 Risk Management Strategies and Techniques

6.1 Losses Due to Natural Hazards

Over a 20-year period from 1975 to 1994, the U.S. spent approximately one quarter of a billion dollars per week on meteorological natural disasters. Worse, some 6,000 people were killed and over 50,000 injured by meteorological natural disasters in this period. These figures are from a preliminary compilation of losses due to natural disasters in the U.S. and its territories by the Natural Hazards Research and Applications Information Center (NHRAIC).

The following hazards are included in the data base: avalanches, droughts, dust storms, earthquakes, extreme cold, fires, floods, fog, heat, hurricanes, landslides, lightning, microbursts, rogue waves, severe storms/hail, ice/sleet, rain, snow/wind, tornados, tropical storms, wind (not associated with severe storms), and volcanoes.

During the last 20 years, earthquakes and hurricanes were the primary causes of monetary losses, and tornadoes were responsible for most deaths and injuries.

Tornadoes, floods, and heat were the three meteorological hazards that caused the most fatalities (accounting for 23%, 14%, and 11% of the 20-year total); while tornadoes, wind due to severe storms, and hurricanes were responsible for the majority of injuries during this period (accounting for 51%, 11%, and 10% of the 20-year total).

Hurricanes, floods, and tornadoes were the three meteorological hazards that caused the most property damage (accounting for 42%, 33%, and 6% of the 20-year total), while the majority of crop damage was caused by floods, drought, and hurricanes (accounting for 27%, 26%, and 20% of the 20-year total).

During the last 20 years, new records were frequently set for the costliest single natural disaster in the U.S. In 1989, Hurricane Hugo exacted losses of $6 billion. In the same year, the Loma Prieta earthquake cost $10 billion. In 1992, Hurricane Andrew cost $20 billion, and in 1994, the estimated loss from the Northridge earthquake topped $25 billion. These individual events dominated the FEMA and PCS data sets, as well.

The three costliest presidentially-declared disasters between 1989 and 1994 (and the corresponding FEMA payouts for disaster assistance) were the 1994

Northridge earthquake ($9.7 billion in disaster relief); Hurricane Andrew in 1992 ($2 billion); and Hurricane Hugo in 1989 ($1.3 billion).

The three costliest years during this period were 1989, 1992, and 1994 (with $18.2 billion, $16 billion, and $7.6 billion paid out on insured losses, respectively). The magnitudes of these losses are greater when considered at local rather than national levels.

Compiling this data has revealed many problems in keeping track of losses due to various natural disasters. Previous loss records have only indicated the overall scale and scope of the problem. Floods rank as one of the deadliest and costliest disasters worldwide; yet, according to the U.S. Army Corps of Engineers, there is no one agency with the specific responsibility for collecting and evaluating flood loss information. As a result, national flood loss estimates are approximations at best.

By themselves, these data are little more than another set of statistics. To help create a safer nation, they need to be integrated with national data bases on likely future events and mitigation practices. Future data generation will require the systematic collection of information on the type of loss, the location, and the actual dollar amount to ensure accurate comparisons across hazards.

6.2 Insurance Issues

Before 1988, the insurance industry world-wide had never experienced a loss greater than $1 billion due to a single event. Since that date, there have been numerous natural disasters that have exceeded that figure. Topping the list is Hurricane Andrew, with insured losses exceeding $15.5 billion. The Northridge earthquake is a close second, with current estimated damage in the range of $13 billion.

These events have severely strained the capacity of the insurance industry to provide financial protection against future disasters. The increasing concentration of population and new structures in hazard-prone regions, notably coastal areas subject to hurricanes, suggests that catastrophic losses are only likely to increase in the future.

6.3 Emergency Warning

In addressing an emergency warning, we need to look at four different categories: science, policy, technology, and research.

Category 1: Science

It is important for people to understand that the earth-meteorology relationship is an extremely complex one. It is this complexity that makes it difficult to forecast and predict events with great accuracy. Scientists must be careful not to over warn (present worst-case scenarios) in the face of a hazardous event; doing so might lead to a loss of credibility of those who must warn the public. Scientists must also be consistent in the way that warnings are issued.

Category 2: Policy

There are a variety of different actors in emergency management that were not involved 20 years ago--for example, the U.S. Forest Service or National Park Service. This involvement will continue, as will the increased participation by private sector agencies that engage in forecasting hazardous events. Those involved must not be in competition with each other.

Category 3: Technology

There continues to be an over-reliance on detection rather than response. Advances in technology, such as Doppler radar, are only part of the answer. "Hi-Tech" must be accompanied by "hi-touch."

Category 4: Research

There has not been enough effort in the past 20 years to look at the impact of emergency warnings. The link between the awareness of individuals and their actions is still vague.

What works? What is the value of warnings research in terms of saving lives and reducing property damage? Is society better off, 20 years later, as the result of an abundance of warnings research?

6.4 Barriers

A major institutional barrier is the focus in the U.S. on private property. It was noted that the idea of private property is close to a religion in the U.S.. As the myths of private property persist and grow stronger, they result in the mixed public message of "get government off my back" and "send help with no strings attached." It was also noted that the public misinterprets, or misrepresents, the historical, legal nature of private property, ignoring the view of land as a social good and ignoring the fact that government is endowed with the right to limit private use for the common good.

Other barriers include the fact that often (1) there is little coordination/cooperation between organizations, especially between the state and local levels of government, (2) mitigation is more difficult in already developed areas, (3) engineers encourage structural solutions, (4) hazards planning has traditionally been narrowly focused, and not multi-objective, (5) the politically expedient thing to do after a disaster is to get things "back to normal" as soon as possible,(6) people comply to the minimum standards/regulations and assume they are safe, and (7) those in nonhazardous areas are unwilling to pay for those in hazardous areas.

6.5 Cost/Benefit Analysis

Cost/Benefit Analysis is the most important research question whose answer would foster wider, more effective application of land use adjustments. It calls for increased information on the true cost to society of building in hazardous areas. In

addition, we need to understand the increasingly cumulative, catastrophic nature of hazards problems.

Such information could be used to show communities their precise risks and could facilitate decision making. Once the public really understands the issues, they do not support narrow property rights definitions of private property.

If Cost/Benefit Analysis is to be used, we must recognize and understand the process by which costs and benefits are unevenly distributed.

- Cost/benefit analysis does not take into account our values and, in a democracy, values are important. "Hazard" is a relative term, depending on the values held.
- Cost/benefit analysis assumes the longevity of current market values and does not take a long-term view.
- "Honest uncertainty" is called for in Cost/Benefit Analysis. We need to be more honest about what we do and do not know.
- We need evaluations of costs and benefits that people believe in, not the current situation where the federal government says communities must fend for themselves after a disaster but, in reality, rushes in to help when disaster strikes.
- We should not get caught up with the details of costs and benefits. *What is needed is to go through the community process of figuring out advantages and disadvantages.*

Process of Consensus

Most people took some exception to the adage "all mitigation is local." While the adage is true to some extent, it is also true that local governments are creatures of the state, and the state is a creature of the federal government. The idea of local autonomy is absurd when federal subsidies are so much a part of local land-use practices. It takes collaborative or coercive state and federal efforts to implement many local land-use planning efforts. However, federal and state mandates are rarely effective at the local level.

Given this situation, important questions to answer are: *How do you instill the desire at the local level to make planning decisions from a multi-objective perspective? How can an effective process of intergovernmental cooperation be created? How does a successful process of community evaluation and implementation of land use occur? Further, how does such a process occur, given today's new social conflicts and interest groups?*

The historical and legal issues in disaster policy show that for a majority of U.S. history there was no national disaster policy. Prior to 1950, disasters were viewed as "Acts of God." The only responsibility to aid victims was based on a moral or

ethical obligation of one citizen to another, and disasters were viewed as a local or state issue. From 1803-1947, only 128 specific acts of assistance came from the U.S. Congress. It was not until the 1960s that a philosophical shift occurred. Now, billions of dollars are spent at the national level for disaster assistance.

The issue may be framed as, *"Has federal assistance limited or hindered mitigation efforts by local and state jurisdictions?"* What must be resolved are questions of the appropriate division of responsibilities for hazards, a better definition of mitigation, what role the national government has in local land-use and mitigation issues, and how best to create incentives to promote mitigation.

6.6 Mitigation

6.6.1 Community Efforts

Risk management strategies can be almost perfectly identified with mitigation measures designed to help build disaster resistant communities. They are intended to help "mitigate" or protect communities, residents, organizations, businesses, infrastructure, and the stability and growth of the economy as much as possible against the impact of natural disasters BEFORE they happen.

Experience has shown again and again that lives can be saved, damage to property can be reduced significantly, and economic recovery can be accelerated by consistently building safer and stronger buildings, strengthening existing infrastructures, enforcing building codes, and making the proper preparations BEFORE a disaster occurs.

More important, mitigation investments by the businesses and citizens of a community will enhance and strengthen the economic structure, stability, and future of that community regardless of when a disaster may strike.

Building disaster resistant communities means bringing them together, in a collaborative effort, to prepare for - and protect themselves against - natural disasters. To accomplish this goal, pre-disaster activities can be organized into four phases.

- Building Community Partnerships
- Identifying Hazards and Community Vulnerability
- Prioritizing Hazard Risk Reduction Actions
- Communicating Success

The successful implementation of these phases within a community - beginning with identifying crucial partners; continuing with determining risks and prioritizing actions; developing a specific mitigation plan; and communicating activities and sharing the success to sustain support and maintain involvement - is the key to building disaster resistant communities.

Building Community Partnerships

Natural disasters permeate every corner of our communities. No individual, business, or organization is left untouched. If a community were to suffer the hardship of a natural disaster, everyone in that community would need to pull together to recover. This partnership is inherent in any community's struggle to address the consequences of earthquakes, floods, hurricanes, or wildfires. When carrying out an agenda of mitigation, this same partnership will be central to your long-term success.

In helping one's community protect itself against natural disasters, one will be most effective if one draws upon the experiences, resources, and policies already in place within that community. The challenge is to bring together all of these elements under one roof to reduce redundancy, identify weaknesses and strengths, and ensure the most effective effort. Communities should form or identify a Disaster Resistant Community Planning Committee composed of local officials, business professionals, and other stakeholders with a shared interest in and obligation to protecting the safety and economic stability of the community for the future.

Business people are often community leaders -- their responsibilities to their business and community are both complementary and interwoven. This is a mutually beneficial process that already exists to some extent: The loss-reduction efforts undertaken by local governments naturally support corporate risk reduction and vice versa.

The cooperative collaboration will help determine the best outcomes in disaster resistance initiatives. For example, perhaps someone already has developed a business interruption plan that others can emulate to minimize loss of jobs and activity resulting from disaster. Or, perhaps another partner could offer incentives to help others address their own risks.

Building consensus about the mitigation needs in a community is essential to success. A broad-based task force can build upon the views of everyone involved -- from the citizens of the community to construction professionals to businesses and to policy makers -- and identify the roles each can play in building a disaster resistant community.

Besides reducing the direct costs associated with natural disasters, mitigation reduces important indirect costs such as the disruption of daily routines, community services, commerce, and industry. Listed below are the primary sectors in a community that can be considered essential to mitigation and pre-disaster efforts. Each should be represented on the Disaster Resistant Community Planning Committee. They are as follows.

- Industry & Business
- Infrastructure: Transportation, Utilities & Housing

- Volunteer- & Community-Based Organizations
- Health Care
- Government
- Workforce
- Education

Various sectors of the community have different interests. However, they can all find a common goal in building a disaster resistant community. For example, the business and labor sectors have a significant interest in the durability of the communities in which they operate. The community supplies their work place, their work force, and their market. It also supplies the infrastructure systems such as roads, electricity, and water on which commerce relies.

A close look at the definitions of the words “community”, “partnership” and “alliance” reveals that they are linked. It takes alliances to build partnerships and partnerships to make up a community. Much of this partnership exercise will consist of building on existing alliances and re-defining the nature of other partnerships.

Industry & Business. The business community can help the greater community reduce its vulnerability to disaster by considering how its mitigation needs apply to the community beyond its business. Internal, business-specific priorities -- such as ensuring transportation systems and routes to facilities remain clear and functional following a disaster -- also benefit the employees who work at the business, the surrounding neighborhoods, commerce, and the economy. Furthermore, many businesses have direct economic incentives for enacting and participating in mitigation efforts undertaken by a community.

Infrastructure. A community's infrastructure provides the lifelines without which citizens and businesses could not function. It is vital that representatives of lifeline organizations be involved.

Transportation systems. These include road, bridges, railroads, transit systems, ports, and airports. They are critical to disaster response and recovery, as well as to facilitating ongoing commerce. Damage can leave communities isolated and at economic risk. Transportation experts can provide a wealth of knowledge and insight as participants on the committee.

Utilities. Utilities serve communities with electricity, natural gas, heating fuels, fresh water, and wastewater disposal. Utility loss can create critical problems for emergency response, life support in hospitals, business operation and recovery. Utilities represent one of the most critical lifelines and must be involved.

Housing. Single-family and multi-unit building housing is often needlessly exposed to damage because of location in a hazard zone or because of structural

weaknesses that make it vulnerable to damage. Building practices and outdated building codes often exacerbate conditions that create avoidable risks to life and damage that would render the buildings useless after a disaster. The debris created from damaged buildings and homes restricts mobility and imposes clean-up costs on local governments.

Volunteer & Community-Based Organizations. The philanthropic missions of many of the community's civic and religious organizations should compel them to get involved. They invest time and money to improve the community. It would be counter-productive for these caring and dedicated organizations and people to make investments and take actions that might be destroyed by disasters.

Health Care. Representatives of health care facilities must be involved because it is crucial that these facilities are built or retrofitted to withstand hazards so they can provide continuous service.

Hospitals. Hospitals provide not only the vital medical services a community needs on a daily basis but also serve as a critical element in post-disaster emergency services. Their importance to any community -- pre-disaster or post-disaster -- cannot be overstated.

Federal, State, County & Local Governments. Each of these levels of government play an important role in managing hazard risks - providing early warning, pre-disaster mitigation, emergency assistance, and response and recovery resources. More importantly, it is the role -- as well as the duty and responsibility -- of the government to protect the public health, safety, and economic stability and growth of its communities.

Workforce. Those who work in a community -- whether they are factory workers, accountants, or laborers -- will see their lives, jobs, and families changed if a disaster strikes. By not taking steps to become disaster resistant, a community is in danger --every individual is at risk. The unions, professional societies, and other labor groups must bring resources and spirit to this endeavor. Employees have the power and responsibility to discuss and promote the idea of mitigation with their employers. The job they save may be their own.

Education. Schools and day care centers represent the most important asset of a community -- the living embodiment of its' future. They must be able to withstand disasters without endangering the children they care for. In addition, many serve as primary shelter sites during and after disasters. If schools are closed for long periods of time post-disaster, other problems arise. Parents' day care needs increase. Classes may never get made up. The schools may lose funding from the state if they do not remain operational for a certain number of days, so the school year may be lengthened. Those responsible for educational facilities, therefore, must be involved.

Creating Alliances

A key part of building a disaster-resistant community is creating the alliances that will make it happen. While most organizations involved are already partners in disaster relief and recovery, the idea of committing resources to mitigate disaster effects may be a hard sell. A key part of developing and strengthening a coalition is to make sure that every participant benefits from the partnership. As each organization is contacted and agrees to serve on the Disaster Resistant Community Planning Committee, the collaborations must be negotiated and benefits defined.

In a Disaster Resistant Community Planning Committee, each member should:

- Have the authority to make decisions on behalf of his or her organization.
- Understand and respect natural hazards.
- Understand community vulnerability.
- Acknowledge that citizens, agencies, businesses, and individuals are responsible for addressing risks.
- Have some knowledge of how to address community risks.
- Have the desire to address risks and mitigate them.
- Have the ability to communicate to colleagues, partners, and others.

Sharing information among all partners is crucial to reducing risk. Not only is each member responsible for their own interests, personnel, and facilities, they need to provide information about those interests, needs, and concerns to others--because what affects one partner will have a resonating effect on the others.

The following organizations and community groups should be involved in disaster mitigation efforts. This potential partners' checklist is meant to be a guide; everybody can design their contact list to meet the specific needs of their community.

- **Industry and Business**
  - Employers (top 10 or 20 minimum)
  - Business Associations (regional and neighborhood)
  - Chambers of Commerce
  - Real Estate Developers
  - Construction Industry

- **Infrastructure**
  - Transportation Systems (public and private)
  - Public housing
  - Utilities
- **Volunteer and Community-Based Organizations**
  - Faith-based groups
  - Red Cross
  - Lions Club, Rotary, other clubs
  - American Association of Retired Persons
  - Public interest groups
  - Parent Teach Associations
  - Environmental groups
  - Neighborhood Associations
- **Health Care Facilities**
- **Government**
  - *Federal*
    - FEMA and other agencies
  - *State*
    - State agencies
  - *County and Local*
    - Elected officials
    - Town and city managers
    - Task forces
    - Police, fire, public works, planning departments
- **Workforce**
  - Unions
  - Professional Groups

- **Education**
  - School Board
  - Public and private schools
  - Universities and community colleges
  - Vocational and continuing education
  - Day care and child care centers
  - Nursery schools and pre-kindergarten

6.6.2 Identifying Hazards and Community Vulnerability

A community that wants to reduce its existing exposure to natural disaster losses and ensure that its exposure to these hazards does not worsen should take these preliminary steps.

- Hazard Identification - Define the extent to which natural hazards threaten the community (e.g., mapping);
- Hazard Vulnerability - Identify, using current knowledge or some degree of existing building stock, those structures and areas that are vulnerable to hazards. In addition, a community growth plan or plat map super-imposed on the hazards map will help identify areas vulnerable to natural hazards.

Everyone knows that natural disasters pose some threat to homes, businesses, and communities. We know that severe winds can damage the roofs on our houses and that heavy rains can flood our basements. We usually are aware of the natural disaster history in our communities. We know whether there have been floods, earthquakes, tornadoes, hurricanes, or wildfires. We also know that it is always a good idea to have some access to scientific expertise when identifying our natural hazards.

Hazard Identification

Hazard identification determines which areas of a community are affected by disasters, how likely it is that the disaster may occur, and how intense the disaster might be.

Floods, earthquakes, severe winter storms, and wildfires are the most frequently occurring natural hazards in Oregon. Some of these events can cause related or secondary hazard problems. For example, floods can cause mudslides, earthquakes can cause landslides, and wildfires (because they destroy plants) can make hillsides prone to landslide or mudslide.

Quantifying the natural hazard threat to the community helps prioritize the neighborhoods and areas of most concern:

- Where are floods most likely to occur?
- How strong are the winds that can affect us?
- Where are the earthquake fault zones located?
- Does the composition of a community's soil make it prone to problems like landslides?
- Are our native plants the sort that exacerbate or retard fires?

Mapping the hazards that threaten the community allows one to begin a process of identifying the areas that are most at risk and therefore the areas where community risk-mitigation programs should focus. It also provides an objective basis for decisions. The more refined the maps of natural hazards are, the more refined the decisions about those hazards can be. If the probabilities of a hazard event in each area are known, a "cost-benefit" approach can be taken when making a decision.

Vulnerability Identification

Vulnerability identification determines which facilities are at risk and to what degree they might be affected, as well as how they might affect the vulnerability of other structures.

Natural hazards invariably "seek out" the weakest part of buildings or systems. Strong winds will find the portion of the roof not properly nailed down. Ground motions will find the weak building connectors - structural damage, or worse, building failure, will result. The water treatment plant in the flood plain will stop functioning, and businesses throughout the community will be forced to close until water is restored. Finding the weak points in systems -- identifying building types that are vulnerable to damage and anticipating the loss in high risk areas -- helps in making decisions about the expenditure of resources to reduce the potential for disaster.

In assessing one’s community's vulnerability to a natural hazard, one needs to know what level of hazard has been identified and what kind of building (function and construction type) is considered. Geographic Information Systems (GIS) can help to overlay hazards mapping onto building locations and structure types. Moreover, a GIS can plot utility systems and grids so that weak points (e.g., in the electrical distribution system) can be spotted.

Following is a checklist that can be used for vulnerability assessment.

- Identify significant buildings by use, type, date of construction, location, ownership.
- Identify utilities and transportation systems.

- Estimate the potential for damage and loss of function due to different levels of natural hazards, using information about expected performance of buildings, utilities, and transportation systems.
- Set loss-reduction priorities and land use policies for emergency and recovery planning.

Risk assessment defines the potential consequences of a disaster based upon a combination of the community's hazard and vulnerability identification.

6.6.3 Prioritizing Hazard Risk Reduction Actions

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.

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.

Also, 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 parts

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.

Tools to Reduce Risks

Three major categories of action will emerge as mitigation measures the community wants to implement are examined.

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

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

The measures implemented to mitigate risks in new construction and community growth will help ensure that the relative risk in a 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 the new buildings to perform during the hazard events whose effects are to be mitigated. Life-threatening collapses should be avoided; however, it needs to be determined 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.

Mitigation Measures dealing with community growth may include the following.

- Planning for open space acquisition of high hazard potential areas.

- Adopting 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.
- Providing 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 projects that reduce disaster losses.
- Developing 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).
- Identifying disincentives and recommending steps to remove them.
- Identifying and seeking legislation needed to provide incentives.
- Considering use of redevelopment to finance and manage building retrofit efforts.
- Determining whether there are incremental mitigating improvements that can be made to facilities as part of ongoing maintenance and performance enhancements.
- Upgrading plumbing and electrical systems and anchor architectural finishes and equipment.
- Supporting community efforts to improve or replace vulnerable utilities and transportation systems.

Mitigation measures to improve code enforcement may include the following.

- Providing training for plan checkers and inspectors regarding code requirements and the principles pertinent to the hazard.
- Adopting administrative procedures, "triggers," (as part of the building code) 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.
- Adopting ordinances or guidelines that will guide owners' efforts taken to reduce the probability of future losses.

- Creating a process to consider codes drafted by outside organizations and to garner endorsement from the local engineering community.
- Reviewing the codes used by the city to determine whether they address the hazards identified for the city.
- Surveying 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.
- Providing public information activities.

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 the following.

- 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.

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, the community will incorporate mitigation into its day-to-day decision making.

One of the best ways to enhance mitigation in a 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 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.

It is always worthwhile to have expert advice and input about the selection of the most cost-beneficial technique for the 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.

Mitigation Plan Priority Listing: The final step in implementing the process of building a disaster resistant community is to prepare a long-term plan that specifies a strategy for accomplishing 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 partner can contribute to disaster resistance goals.

Above all, the critical need to communicate with citizens and businesses about the importance of disaster resistance cannot be overstated. The best way to have the positive message of mitigation take root in a community is to ensure that the community is informed about the undeniable benefits of mitigation and the effect it will have on the community in the future.

6.6.4 Communicating Success

To maintain and generate interest and public support, a publicity subcommittee may need to be established, to be responsible for developing a communications plan that utilizes mass media, special events, spokespersons, and educational outreach.

A chairperson could be appointed to head up the effort. It is important to note that it will be incumbent upon the subcommittee leader to ensure media coverage and community awareness. It may also prove important to make sure everyone gets a fair share of air time (i.e., all participants and partners should receive the amount of exposure appropriate to their involvement, experience, and desire to communicate with the public).

Print, radio, and television outlets should be targeted at planned intervals with the messages. As gatekeepers to the community, the media affect and shape our opinions and our behavior. They influence our preferences and our choices. By encouraging reporters to write or broadcast our messages, we will generate awareness and interest in the community mitigation efforts.

A targeted, comprehensive media list is the most essential tool of any successful media campaign. The media list should include the reporters in the area who are likely to cover news about community mitigation efforts, most likely those who cover community affairs, natural disasters, or the metro desk.

To help target appropriate reporters, news should be monitored to find out who is writing or saying what. In addition to familiarizing with the particular "beats,"

reading, watching, and listening to the news can provide insights into building relationships with the media.

Even though each community will have its own overriding communications objective, the key message in support of building a disaster resistant community is mitigation. In order to mitigate effectively, partnerships need to be formed to lessen the impact of a disaster or hazard to a community before it occurs. Therefore, the secondary message most likely will include the strengths and benefits of alliance building. Once the communications objective has been agreed upon by the members of the Disaster Resistant Community Planning Committee, the key message must be included in all communications: public presentations, written "letters to the editor," opinion-editorial columns, and media interviews. That message should be used and repeated to ensure that the entire community hears and understands the role of the committee in building a disaster resistant community.

Journalists in the community may be ideal partners for participating in and promoting mitigation. Media outlets serve a dual role in a community. They are a vital source of news and public information before, during, and after a disaster, and, as employers, they are members of the business community. Partnering with the local newspaper or television station will ensure appropriate, ongoing coverage of disaster mitigation efforts while involving a valuable business partner whose actions are highly visible throughout the community.

7 Special Needs Groups

The increasing socioeconomic and cultural diversity of people at risk to hazards in Oregon has altered the distribution of disaster impacts. Gender, socioeconomic status, ethnicity, and the distribution of power and wealth strongly influence levels of exposure to natural disasters. These factors determine the distribution of and access to hazard mitigation tools.

There are two views of those affected by disasters and the role government plays in assisting them. The first, "paternalistic" view sees victims as victims and the role of government as having to improve their welfare. The second sees victims as "agents" capable of making decisions to improve their own welfare. The government's role is then simply to provide good information, which the agents use to make choices necessary to improve their own conditions.

Being poor and/or a member of a minority group acts as an independent variable in susceptibility to risks, although this may be an over generalization. Affluence carries a future-oriented view, more trust in government institutions, and a sense of efficacy and responsibility.

Being poor carries less of a long-term view, less trust in government, and little sense of individual efficacy and responsibility. Because of these and other factors, managers and providers of information need to be concerned about the form of information provided to all citizens, with sensitivity given to the cultural diversity

of the audience through message format, sourcing, and consideration of factors that lead to motivating the user, engendering trust, and ensuring usefulness.

Another aspect to be discussed is women's role and contributions to emergency management. For example, in order for disaster mitigation activities to be effective, more women need to participate in planning, design, and implementation. Gender differences in household work patterns are one primary reason many if not most domestic decisions are left to women. One quarter of all households have women as their head, with that percentage increasing in minority groups. In a study following Hurricane Andrew, women respondents reported they were responsible for preparing family members, with men performing work outside the dwelling. Moreover, women's roles as care givers place them in position to add value to disaster program design by enhancing access to relief programs for all who need them and by supporting medium-term recover activities.

Ethnicity is also a factor to be considered in emergency management. Ethnicity and social class are intertwined. In reference to stratification factors, to qualify for individual assistance, applicants must meet certain criteria that were developed based on the average, home-owning, middle-class family. This orientation misses cultural differences, such as who lives with you, how records are kept, occupation, and renters.

Following the Northridge Earthquake, a hostile attitude was created against all people of Mexican origin, even those who were legal immigrants. This hostility, sensed by members of this ethnic group, produced widespread avoidance of available relief services. However the pre-existence of organization within minority groups can contribute to equal access to services.

FEMA's recent flexibility in the disaster assistance process is clearly a signal of increased sensitivity to ensuring equitable treatment of all citizens affected by disasters.

7.1 Helping Children Cope with Disaster

After a disaster, most parents' first concern is the health and well-being of their children. Finding a warm place to sleep and food to eat is only the first step in caring for a child in these circumstances. Disasters are particularly traumatic for children, so adults must be extra sensitive to their emotional needs and make a special effort to reassure them that they will do their best to protect them.

Disasters may cause children to fear abandonment, injury, and even death. Fantasized fears are real threats to children. Although it may seem to make more sense to leave a child in a safe place while looking for housing or assistance, children may become anxious that parents might not return. Children should be taken along, and the entire family should be kept together as much as possible.

It is useful for adults to share with their children a bit of their own sense of fear and concern to help children understand that these feelings are normal and acceptable.

Children, like adults, recover from trauma at different speeds. Sometimes a trained professional counselor is needed to help a child fully heal. If the child is having an ongoing sleeping problem or difficulty concentrating, or if fears surrounding the disaster seem to have become worse, counseling should be considered.

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