

## **The Costs and Benefits of Individual Hazard Mitigation**

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There are a great deal of government and other public organizations that discuss the need for family and individual disaster preparedness. These vary from the Department of Homeland Security (DHS), the Federal Emergency Management Agency (FEMA), local emergency management and public safety entities, the National Weather Service (NWS), Centers for Disease Control (CDC), the American Red Cross (ARC), Citizens Corps, emergency management professional associations and Volunteers Active in Disasters (VOAD), to name a few. Much of what is listed as “preparedness” is in fact actually “mitigation”. This paper will discuss the benefits of family and individual mitigation, the associated costs, and whether it is worth the costs to realize the benefits.

The 2004 National Response Plan defines Mitigation as “activities designed to reduce or eliminate risks to persons or property or to lessen the actual or potential effects or consequences of an incident. Mitigation measures may be implemented prior to, during, or after an incident. Mitigation measures are often developed in accordance with lessons learned from prior incidents. Mitigation involves ongoing actions to reduce exposure to, probability of, or potential loss from hazards. Measures may include zoning and building codes, floodplain buyouts, and analysis of hazard-related data to determine where it is safe to build or locate temporary facilities. Mitigation can include efforts to educate governments, businesses, and the public on measures they can take to reduce loss and injury.” (NRP 69) Simply put, when an individual or family accomplishes mitigation activities, they are putting into place measures to reduce or eliminate the risks to health and property created by natural and manmade hazards.

As stated in the first paragraph, mitigation ideas are typically meshed in with preparedness ideas and given the title as preparedness. But there are differences between “preparedness” and “mitigation”. The 2004 National Response Plan defines Preparedness as “the range of deliberate, critical tasks and activities necessary to build, sustain, and improve the operational capability to prevent, protect against, respond to, and recover from domestic incidents. Preparedness is a continuous process involving efforts at all levels of government and between government and private-sector and nongovernmental organizations to identify threats, determine vulnerabilities, and identify required resources.” (NRP 71). Whereas, mitigation is steps taken to eliminate or reduce the risks created by hazards, preparedness is steps typically taken to deal with an event once it occurs. An example of a mitigation measure would include creating a clear zone around a home by removing all burnable materials within 30 feet of the structure. Should a forest fire occur in the immediate area of the home; the chances that home will burn will be greatly reduced. An example of a preparedness activity would include developing an evacuation plan for the family to quickly exit the home should it catch fire. Mitigation reduces the chances of the property catching fire. Preparedness causes a more efficient response to the fire. Both mitigation and preparedness activities are important. Should families and individuals implement mitigation and preparedness activities, they will be more likely to “weather” a storm without loss of life or property. They will become a resource instead of a detriment to their community.

The following family and individual mitigation activities were gleaned from several “disaster preparedness” websites. This paper will review those mitigation measures that apply to the hazards of Home Fires, Winter Storms and Flooding.

## HOME FIRES

Many entities promote the installation and periodic inspection of smoke alarms in residential properties. It has been shown that smoke alarms decrease an individual's chances of dying in a fire by 50 %.(FEMA Disaster Info). Smoke detectors are a good example of mitigation because it is an activity that if implemented before a home fire occurs, it can reduce the chances of loss of life. Other good examples include the installation of fire escape stairs, construction of multiple fire exits, provision of collapsible fire escape ladders, and the installation of egress windows in residential properties. This differs from such "preparedness" activities as exercising escape plans and practicing staying low to the floor when moving during a fire. Preparedness steps are activities to make response more effective. Mitigation measures reduce the odds of the fire negatively impacting the family or individual.

Other Home Fire related mitigation activities include keeping flammable materials, such as towels, pot holders and curtains, away from cooking stove areas. (FEMA Disaster Info). Cleaning stove surfaces to eliminate grease buildup helps to reduce the odds that a fire will start in the first place. Families and individuals should eliminate the storage and use of flammable materials, such as gasoline or lighter fluid, inside the home. Again, this will reduce the odds of a fire starting. Rags soaked in flammable materials should not be discarded inside a structure. Nor should clothes soaked in flammable materials be washed in a washing machine. And dryer vents should be cleaned of build up lint periodically. These are all simple activities that when accomplished will reduce or eliminate the chances of a fire beginning in the home.

A few of the leading causes of residential fires include smoking in bed or on couches, children playing with matches, improperly connected and located electrical extension cords and electrical outlet strips or surge protectors. Activities implemented to stop the habit of smoking

where one might fall asleep or smoking near flammable materials; to keep matches out of the reach of children; and to safely utilize extension cords and electrical outlet strips as indicated by the manufacturer's recommendations are all typical hazard mitigation measures. These steps reduce the chances of accidental fire. There would not have to be a response and recovery, if there was no fire. On the side of the coin; training to use a fire extinguisher would be a good example of preparedness actions. (FEMA: Plan Ahead)

Fires may also start outside the home and therefore there are also mitigation measures that may be implemented to reduce or eliminate the chances of a home fire from external sources such as a forest fire.

Forest firefighting professionals encourage the creation of a safety zone around residential structures in the Wildland-Urban Interface. The Wildland-Urban Interface is the area in which homes are closely located or located within wild lands, such as forests. Many areas of the country have large Wildland-Urban Interfaces that are growing each day.

Mitigation activities within the Wildland-Urban Interface may include such activities as removing brush, trees and other organic materials within a perimeter around the home. Wildland firefighting professionals recommend that this safety zone be at least a 30 feet radius around the structures on the property. Vegetation should also be removed from the exterior walls of the home. Vegetation within the safety zone that is highly flammable, to include pine, eucalyptus, junipers and fir trees, should be replaced with vegetations that is less flammable. (FEMA: Plan Ahead)

Improvements to the home that will reduce or eliminate the risk of a home fire caused by a forest fire also include installing the home's electrical service underground and cutting back tree limbs from overhead electrical power lines. (FEMA: Plan Ahead) Mitigation measures may also

include using flame resistant roofing materials and house siding. Some of these structure measures may actually be mandated in local ordinances. Ordinances are a typical method that local governments require and enforce mitigation measures on the homeowner.

## WINTER STORMS

Winter storms are becoming more and more of an emergency event as more and more of society is dependent on electrical-powered equipment and as our aging electrical power distribution system becomes more stressed from daily over usage. There are a great number of activities that individuals and families can accomplish to mitigate the impacts of a winter storm event.

One primary concern is heating. Many homes today are either heated by electrical heating appliances or by furnaces which require electricity to keep a fossil fuel burning. When the electricity goes out due to a winter storm, the homes begin to get cool. Individuals and families can reduce or eliminate the effects of a loss of electrical power to heating sources by acquiring backup heating sources that do not require electrical power. This might include wood or pellet stoves, or natural gas or propane heaters that do not require an electrical ignition. If the home does not go cold, there will not be damages to the property. Nor will the residents get overly cold and forced to evacuate to an alternate shelter.

Another method to eliminate the negative impacts of a power loss caused by a winter storm is to acquire and install a backup power system. Such mitigation measures may include an electrical power generator, solar or wind powered generators or battery backup systems. If there is no loss of power, then there will be no loss of property or endangerment to individuals.

One item that can be damaged because of the cold brought on by severe cold temperatures is water lines in the home. Damage to these water lines may be prevented by insulating the pipes, adding heat tape to the pipes, relocating water pipes away from exterior walls, open “kitchen and bathroom cabinet doors to allow warmer air to circulate around the plumbing.” (FEMA Plan Ahead). Preventing water lines from freezing will eliminate damage to the water lines and may reduce the loss of water to the home. A home without water will make it difficult for individuals and families to stay within the home for an extended period of time.

## FLOODING

“Floods are one of the most common hazards in the United States. Flood effects can be local, impacting a neighborhood or community, or very large, affecting entire river basins and multiple states.” (FEMA: Are You Ready). More damage is caused each year by flooding and more areas are prone to flooding in the United States than any other natural disaster. Therefore, mitigation activities become very important for flooding. The first hazard mitigation program that the Federal Emergency Management Agency (FEMA) implemented was to reduce or eliminate the impacts of flood disasters. FEMA has recognized the importance of floods. The next step is encouraging individuals and families that flood hazard mitigation is a program that they too can implement.

Typical methods of reducing or eliminating damages to personnel and real property include activities to safeguard homes. Homeowners should install or elevate heating and plumbing mechanical and electrical systems in levels of the house that is above expected flood elevations. This will not only reduce the odds of expensive repairs from damaged or destroyed utility systems, but could prevent cascading events such as structure fires. Installing backflow prevention

devices on sewer lines will prevent sewage from backing up into the home during floods. Sewage will contaminate the area of the house that is flooded and may cause mold or make residents sick. Other mitigation methods for reducing the odds of damage to an individual's or family's property is to construct with flood-resistant materials, elevate the base floor above the floodplain elevation, protecting drinking water wells from contamination caused by flood waters, and sealing basement walls with waterproofing compounds. (FEMA: Plan Ahead).

The last two major mitigation measures are methods strongly encouraged by FEMA and by communities that are members of the National Flood Insurance Program (NFIP). To be a member of the NFIP, a community is required to enact and enforce floodplain management ordinances. These will require individuals and families that wish to construct new homes to build these homes so that living areas and utilities for a home are above the floodplain elevation. This is a process that requires residents to accomplish flood hazard mitigation activities for their homes. Purchasing flood insurance is the second major flood mitigation activity. Because of Federal law, banking institutions will not lend money to individuals or families who wish to purchase a home in a "Special Flood Hazard Area", unless they have flood insurance. (Russell p.44). Regular home insurance does not cover floods. This is another flood hazard mitigation activity that is mandated by the Federal government.

There are many hazard mitigation activities that apply to any type of disaster, whether it is a natural disaster, technological accident or man-made incident. One activity is to complete an inventory of all the property owned by an individual or family. By compiling floor plans, photographs, video, receipts, and detailed lists of personal property, there is a much greater chance that an individual or family will receive fair compensation from their home insurance agency when that property is destroyed or damaged in a disaster event. This way the family or

individual will reduce their impact from the losses incurred during the event. Another activity includes filing an insurance claim at the appropriate time with the necessary documentation. “Find out how the company wants to process claims. In the event of a widespread disaster, the company may set up special procedures and send in extra personnel and claims adjusters.” (Prepare.org). Knowing the insurance company’s documentation, reporting, and filing requirements before a disaster, will reduce or eliminate the potential for not receiving fair compensation. Lastly, individuals and families should organize and secure all of their important documents in a water-proof, fire-proof, and portable container. Important documents may include birth certificates, marriage licenses, banking information, insurance policies, identification records, personal and real property records, wills and powers of attorney. Having your important documents following a disaster will help to insure that fair compensation is made from insurance agents, assistance is provided by government departments and other personal may be completed. This will help to reduce the post-incident stress and to allow an individual or family to recover much quicker.

But what does it cost to implement the mitigation activities discussed earlier in this paper? A key component to determining cost-benefit relation is determining the costs of implementing a process or activity.

There are many mitigation activities that can be implemented that require no expenditure of money. These measures may require a time involvement by an individual or family to implement. Measures that only require an involvement of time include: safeguarding cooking stove areas, cleaning stove surfaces, not storing flammable materials inside the home, cleaning dryer vents, not smoking in bed or on couches; keeping matches away from children, proper use or electrical extension cords and outlet strips, creation of a wildfire safety zone, cutting back tree

limbs from overhead electrical power lines, meeting with your insurance provider, creating a property inventory list, backing up records, filing an insurance claim at the appropriate time with the necessary documentation and opening cabinet doors to allow warmer air to circulate around plumbing. (Ready.gov)

Other mitigation measures have a small cost to implement, ranging from a few dollars to a few hundred dollars. These may include: buying a fire extinguisher and smoke alarms, purchasing emergency supplies, providing first aid and CPR training to family members, elevating valuable inventory off the floor, purchasing collapsible fire escape ladders, insulating water pipes or adding heat tape to the pipes, installing sewer line backflow prevention devices, protecting drinking water wells from contamination and sealing basement walls with waterproofing compounds. (Ready.gov)

Finally, some mitigation measures may range from several hundred to several tens of thousands of dollars. These mitigation activities may include: increasing insurance levels or adding insurance for hazards not normally covered, acquiring and connecting a backup generator, installing fire escape stairs, constructing additional fire exits, installing egress windows, placing the home's electrical service underground, adding flame resistant roofing materials and house siding, installing backup heating sources that do not require electrical power, elevating electrical, heating and plumbing systems, constructing homes with flood-resistant materials and elevating the home's base floor above the floodplain elevation. (Ready.gov)

The second part of a cost-benefit relation is the benefit of implementing the hazard mitigation activities. If the benefits can be shown to greatly outweigh the costs to implement the mitigation activities, it is clear that individuals and families should complete these activities as soon as possible.

Many of the activities that can be implemented to reduce or eliminate the chances of a home fire will save real and personal property and lives. Excluding the sentimental value, the listed measures can save an individual or family several hundreds of thousands of dollars. Additionally, these measures can save the lives of family members. Each year, more than 4,000 Americans die and more than 20,000 are injured in fires, many of which could be prevented. Direct property loss due to fires is estimated at \$8.6 billion annually. (Are You Ready) This works out to 1 out of every 75,000 Americans die each year in fires and 1 out of every 15,000 are injured by fires each year. Even mitigation measures that may cost a few thousand dollars are well worth the expenditure.

Mitigation activities that will reduce or eliminate the chances of the damaging effects of the loss of heat and/or electricity during a winter storm can save real and personal property. Because the loss of property will be far less than a home fire and the loss of life is not as likely, mitigation measures that are likely to be implemented for winter storms will also cost less than a home fire, for the measures to be beneficial. However, many of the winter storm mitigation measures will cost less than a few hundred dollars and may only involve a small amount of time.

Flooding can cause nearly as much damage to a home as a home fire can, but the odds of loss of life is not as great as a home fire. Like a home fire, flood mitigation measures can save an individual or family several hundreds of thousands of dollars. Depending on whether a home is located in a special flood hazard area or not, implementing the more costly flood mitigation activities may still be far more beneficial.

There is a distinct difference between individual and family preparedness activities and mitigation measures. Preparedness activities allow for a more efficient response once a disaster event has occurred. Mitigation measures, however, reduce or eliminate the terrible impacts of a

disaster from occurring to an individual or family to begin with. Many mitigation measures involve only the time involved to implement; these are procedural in nature. Other mitigation measures may involve a small cost and are still worth implementing in order to prevent loss of life and property. Once mitigation measures begin to involve significant costs and depending on the likelihood and severity of a disaster event, the cost-benefit ratio may lessen. In these cases, it is a personal choice on whether to implement expensive mitigation measures or not. However, it is critical that all individuals and families analyze their own hazard situation to determine the costs and benefits.

## Bibliography

American Red Cross. (2007). Prepare.org. Retrieved March 17, 2007 from

<http://www.prepare.org/>

Department of Homeland Security. (Nov 2004). National Response Plan, Washington D.C., DHS

Department of Homeland Security (March 17, 2007). Ready.Gov. Retrieved March 17, 2007

from <http://www.ready.gov/america/index.html>

Federal Emergency Management Agency. (July 3, 2006). Are You Ready?. Retrieved March 17,

2007 from <http://www.fema.gov/areyouready/>

Federal Emergency Management Agency. (July 26, 2006). Get Disaster Information. Retrieved

March 17, 2007 from <http://www.fema.gov/hazard/index.shtm>

Federal Emergency Management Agency. (July 26, 2006). Plan Ahead. Retrieved March 17,

2007 from <http://www.fema.gov/plan/index.shtm>

Federal Emergency Management Agency. (March 6, 2007). Hazard Mitigation Planning.

Retrieved March 17, 2007 from <http://www.fema.gov/plan/mitplanning/index.shtm>

Federation of American Scientists (March 17, 2007). Reallyready.org. Retrieved March 17, 2007 from <http://www.fas.org/reallyready/index.html>

Maine Emergency Management Agency. (Apr 24, 2007). Maine Prepares. Retrieved March 17, 2007 from <http://www.maine.gov/mema/prepare/>

National Safety Council (January 17, 2007). National Safety Council, Retrieved March 17, 2007 from <http://www.nsc.org/index.htm>

Russell, David. (1999). It's a Disaster: The Money and Politics that Follow Earthquakes, Hurricanes and other Catastrophic Losses, Los Angeles, CA. Silver Lake Publishing