BUILDING A DISASTER-RESISTANT UNIVERSITY

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FEMA

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FOREWORD

In the last decade, disasters have affected university and college campuses with disturbing frequency, sometimes causing death and injury, but always imposing monetary losses and disruption of the institution's teaching, research, and public service. Damage to buildings and infrastructure and interruption to the institutional mission result in significant losses that can be measured by faculty and student departures, decreases in research funding, and increases in insurance premiums. These losses could have been substantially reduced or eliminated through comprehensive pre-disaster planning and mitigation actions.

Recent Disasters and Universities

In June 2001, Tropical Storm Allison inundated the Houston Area and its universities and colleges with 10 to 24 inches of rain. The total losses are estimated to be $745 million. The University of Texas at Houston Medical School Building had 22 ft. of water in it, causing the hospital to close for the first time in its history and seriously disrupting its research efforts. Damage to the Medical School has been estimated at more than $205 million.

September 11, 2001 reminded everyone of the importance of taking steps to mitigate the consequences of disasters. In the immediate aftermath of the attacks, many higher education institutions reviewed their disaster plans and began to reconsider issues of safety and security. Natural and man-made disasters represent a wide array of threats to the instructional, research, and public service missions of higher education institutions. This document provides planning guidance to these institutions as they prepare to identify their risks, assess their vulnerability to natural and man-made hazards, and develop a hazard mitigation plan. Its purposes are to encourage higher education institutions to take hazard mitigation seriously and to illustrate a course of action for implementing a mitigation program to permanently reduce vulnerability to future disasters.

Resources

The Federal Emergency Management Agency (FEMA) has developed a series of "how-to" guides to assist states, communities, and tribes in enhancing their natural and man-made hazard mitigation planning activities. This document complements the series, addressing aspects of mitigation planning that are unique to institutions of higher education. The guides will be an essential resource for your planning effort and are available online at www.fema.gov/fima/planning.shtm. They can also be obtained free of charge from the FEMA publications warehouse by calling 1-800-480-2520.

This document is both a how-to guide and a distillation of the experiences of six universities and colleges across the country that have been working over the past several years to become more disaster-resistant. It complements the Federal Emergency Management Agency (FEMA) State and Local Mitigation Planning how-to guides that provide planning guidance for creating and implementing a hazard mitigation planning process. These how-to guides are excellent resources for higher education institutions and are referenced in this document whenever appropriate. This guide provides basic information designed for institutions just getting started as well as concrete ideas, suggestions, and practical experiences for institutions that have already begun to take steps to becoming more disaster-resistant. See Appendix B (Library) for a list of the mitigation planning how-to guides.

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Disaster-related losses in the United States continue to rise. At all levels, organizations and governments are adjusting their behavior and policies to reflect the importance of reducing damage caused by extreme events. Hazard mitigation is accepted as good practice and many government jurisdictions now require it. Higher education institutions have an interest on many levels to become more disaster-resistant. Administrators, faculty, and staff are realizing that improving their campus' resistance to disaster will not only protect their own lives and those of their students, it will also safeguard the campus' instruction, research, and public service.

Background

The Disaster Mitigation Act of 2000. The incentive for states and local government to undertake natural hazard mitigation planning was given a boost on October 30, 2000, when the President signed the Disaster Mitigation Act of 2000 (Public Law 106-390). This law encourages and rewards local and state pre-disaster planning, promotes sustainability as a strategy for disaster resistance, and is intended to integrate State and local planning with the aim of strengthening statewide mitigation planning. The new approach facilitates cooperation between state and local authorities, prompting them to work together. This enhanced planning network enables local, tribal, and state governments to articulate accurate and specific needs for mitigation, resulting in faster allocation of funding and more effective risk reduction projects. Colleges and universities can plan for the reduction of hazard losses in concert with similar planning efforts within their host community and/or state.

MITIGATION APPROACH

Over the past ten years, FEMA has awarded millions of dollars in disaster assistance to public and private universities and colleges in the United States. Private insurance carriers have paid out substantial sums to these institutions as well. Losses include measurable interruptions to their instruction and auxiliary services (such as hospitals) and immeasurable losses to research and the generation of knowledge. Moreover, Federal, state, and local governments and private foundations have a substantial research investment in higher education institutions across the country. Every year, Federal research grants to U.S. universities total around $15 billion. Therefore, it is in the best interest of the institution and its sponsors to take stock of the hazards they face and to develop a plan for mitigating their potential consequences.

This document closely follows FEMA's mitigation planning guidance for local communities. Higher education institutions are themselves communities in many ways, and they can draw on important lessons from the efforts of counties and municipalities to reduce disaster risks. Higher education institutions are engaged in and skilled at planning exercises for a wide range of issues; consequently, the addition or improvement of campus-based hazard mitigation planning will yield substantial benefits. Moreover, steps taken to become more disaster-resistant can complement the long-term sustainability of the campus and improve the overall quality of life.

Hazard mitigation planning is a systematic, four-phased process for identifying and implementing actions to reduce or eliminate loss of life, property, and function due to natural and man-made hazards. Each section of this guide focuses on a different phase in the disaster-resistant university planning and implementation process:

- **Phase 1 – Organize Resources** addresses the initial step of identifying the resources available and necessary to complete the effort. Interested and necessary parties are invited to form an advisory committee. An inventory of available planning documents is performed and existing

Recent Disasters and Universities

The Northridge earthquake, which occurred in January 1994, damaged three universities in the Los Angeles area. California State University, Northridge suffered the most: nearly all of its buildings were damaged and the university was forced to close for one month. It was able to reopen to its 30,000 students with 450 temporary trailers serving as the only classrooms. Damages were estimated at $380 million.

plans and documents are collected. The committee develops a strategic plan with obtainable outcomes and completion dates. The FEMA how-to guide *Getting Started* (FEMA 386-1) provides potentially applicable guidance on this process for local and state governments.

- **Phase 2 – Hazard Identification and Risk Assessment** covers the identification of hazards that present risks to the campus and the assets that are vulnerable to those hazards. Higher education institutions must assess the risks and their vulnerability to the full complement of natural and man-made hazards. The FEMA how-to guide *Identifying Your Risks* (FEMA 386-2) provides potentially useful guidance on this process for state and local governments.
- **Phase 3 – Developing the Mitigation Plan** examines the development of the hazard mitigation plan document. Planning is an integral part of many higher educational institutions. The development of a comprehensive hazard mitigation plan should draw from and complement existing plans. It should be developed and integrated with local and state jurisdictions and reflect the unique mission and characteristics of the institution. The plan should be updated regularly and implemented across all levels of the institution. The FEMA how-to guide *Developing the Mitigation Plan* (FEMA 386-3) provides helpful guidance for state and local governments on this process and may assist a college or university in aligning their mitigation plan with those of their surrounding jurisdictions.
- **Phase 4 – Adoption and Implementation** follows the mitigation plan through the adoption and implementation stages. Once the plan has been written, the focus shifts to adoption by appropriate administrative and instructional units and the implementation of its objectives. Even the best plans are inadequate if they are not implemented with vigor and aligned with the campus strategic or master plan. Experience has shown that this can be difficult as institutions face the consequences of having to change their operations and make adjustments to their culture in an effort to become more disaster-resistant. Equally important is the need to establish mechanisms for maintaining and updating the plan to keep it relevant. The FEMA how-to guide *Bringing the Plan to Life* (FEMA 386-4) addresses these issues.

WHO SHOULD PARTICIPATE?

This guide is designed for all higher education institutions (community colleges to research institutions, public and private). Regardless of the institution's mission or focus, hazard mitigation is a good investment. There are differences in the way that small versus large institutions, private versus public, and primarily research based or teaching institutions will plan and adopt the actions described herein. Wherever possible, care has been taken to provide a wide range of ways that the process can be adapted based on the particular characteristics of an institution.

Recent Disasters and Universities

Hurricane Andrew caused $17 million in damage to the University of Miami in 1992. The school was forced to close for almost one month because there was no water or electricity, and it had to purchase round-trip tickets to send students home during the hiatus. Insurance premiums went up dramatically after the disaster.

Should You Do It Yourself?

How can you decide whether to do this yourself? Institutions of different types and sizes have successfully completed risk assessments and hazard mitigation plans. However, some universities and colleges have determined that it was in their best interest to hire a private

company to conduct all or part of the risk assessment and to help them identify and rank their vulnerabilities to various hazards. Many companies provide this service. Contact peer institutions; professional associations; and local, state, and regional emergency management offices to help you determine if a private consultant is appropriate. If your institution chooses to engage the services of a private consultant, this guide provides important background information on the process to allow you to prepare the contractual materials necessary to obtain a satisfactory product.

Background

Four phases of emergency management: Preparedness – includes plans and preparations made to save lives and property and to facilitate response operations; **Response** – includes actions taken to provide emergency assistance, save lives and minimize property damage, and speed recovery immediately following a disaster; **Recovery** – includes actions taken to return to a normal or improved operating condition following a disaster; and **Mitigation** – refers to activities that eliminate or reduce the chance of occurrence or the effects of disasters.

Integrative Approach

The responsibility for emergency management in the United States is shared across many levels of government and the public and nonprofit sectors. To be successful at its hazard mitigation planning activities, your institution must integrate its efforts with appropriate local, state, and Federal agencies and organizations. Higher education institutions must work collaboratively with first responders and emergency managers in their area. They also must coordinate with state and Federal emergency management organizations because response, recovery efforts, and mitigation actions are funded and supported in part by these entities.

This guide takes a multi-hazard approach, recognizing that institutions face a wide variety of potential man-made and natural disasters. Not every disaster can be avoided, but steps can be taken to reduce the consequences of many extreme events; however, these threats can only be identified and mitigated through systematic, comprehensive, *pre-disaster* planning that leads to the creation, adoption, and implementation of a hazard mitigation plan.

HOW TO USE THIS GUIDEBOOK

This book is not meant to be the last word on any of the subject matter covered. It is intended to provide an easy-to-understand set of guidelines, to be supplemented by more extensive technical information and the use of experts when necessary. As with states and communities, the planning process for your campus will be as individual as your institution. Therefore, the step-by-step information in this book should be considered only as guidance.

The framework for this book is based in large part on the mitigation planning guidance developed for state and local governments in the form of a series of how-to guides (mentioned above). Frequent references to these guides will be made throughout this book, and it is suggested that you review the guides before beginning campus mitigation planning efforts. The worksheets shown herein were adapted from these mitigation planning how-to guides produced for states and local jurisdictions. Blank worksheets are all presented in Appendix A.

MAKE A COMMITMENT

Recent Disasters and Universities

In April 1997, the Red River inundated the University of North Dakota. The University was forced to relocate critical functions such as the computer center and had to suspend many of its operations. After a month of inspection, clean-up, and repairs, the university reopened. Damages totaled $46 million.

A disaster-resistant higher education institution recognizes the threats posed by natural and man-made hazards to its campus and mission. It formulates policies, programs, and practices to assess its risk and implements these across all of its teaching, research and public service activities.

The leadership of a higher education institution understands the need to sustain the university's teaching, research, and public service responsibilities in light of the damage, repair delays, and financial difficulty that disasters can bring to a community. The goal is to withstand the effects of probable hazard events without unacceptable losses or interruptions; in other words, to be resilient.

Resiliency is characterized by the institution's ability to minimize the impact of probable hazards and limit their interruption to the mission of the university or college. This does not mean that there will be no damage from large events; indeed, damage from natural and technological disasters varies by the force and location of the event. However, a disaster-resistant university strives to mitigate this damage. Campuses vary in their definition of acceptable losses and interruption because these decisions depend on the community, the nature of the hazard, and the available resources.

Once the commitment to become has been made, the first step is to organize resources and develop a strategic plan for the process ahead. This means identifying resources on and off campus, identifying a campus leader, developing an advisory committee, and gathering information. The success of the disaster-resistant initiative depends on the extent of participation by on- and off-campus stakeholders. These stakeholders bring the commitment, knowledge, and enthusiasm needed to complete the planning process and adopt a mitigation plan.

IDENTIFY RESOURCES

On- and off-campus stakeholders are crucial to the success of any disaster-resistant initiative. The best place to begin is on campus. Higher education institutions are complex and varied organizations, but they all share a basic structure that serves as the foundation for the hazard mitigation planning process.

Start with a thorough inventory of all potential stakeholders across the three traditional divisions of academia—administration, faculty, and students. All of these groups should be involved from the very beginning of the disaster-resistant university initiative. While their stakes differ and their commitments are not likely to be equal, each will play an important role in the success of the initiative. The inventory will assist you in the next step of identifying an advisory group/committee.

University or College Administration

The active commitment and involvement of the institution's chancellor or president and chief academic and business officers is crucial. An inventory of available resources is equally important as commitment, which is presumed to exist if the planning process is to move forward.

A complete inventory of the academic and business units at the campus should be completed during this stage. Examples of common stakeholders are listed below.

University, College, School, or Division Planning Entities. Planning organizations exist at many levels of the university, and it is important to identify all of the various planning committees that might share an interest or have jurisdiction in the area of hazard mitigation before the planning process gets too far. Begin at the top with institution-wide committees and work your way down to academic departments, if appropriate. Many institutions have planning councils or committees, physical facilities committees, a master plan committee, building and grounds committees, and other such groups. These may be replicated at the college level and even at the academic department level in some cases. The identification of these committees may begin with contacting the institution's chief academic officer, meeting with college deans and department chairs, and researching accreditation documents. These committees are particularly important because they share a common focus on planning and many of their component jurisdictions will be involved in the mitigation actions once the plan is implemented. For example, an institution-wide campus master plan committee is likely to be a key player in the location of future capital improvements; since location of the built environment relative to potential hazards is a significant driver of hazard mitigation decisions, the committee's commitment to this process is important. The mission statement, jurisdiction, and membership of each committee identified in this process should be collected.

Resources

The importance of planning across all aspects of higher education is emphasized by several organizations, including the Society for College and University Planning www.scup.org, American Association of Community Colleges www.aacc.nche.edu, and the National Association of College and University Business Officers www.nacubo.org. These organizations provide college and university planners with a wide range of resources through national and regional conferences and web-based materials, including links to many university and college disaster and emergency plans.

Institutional Research. Many institutions have offices, divisions, or committees that collect and conduct institutional research. While their work is not likely to be hazard-specific, their involvement is important because they are often the repository of institutional plans and data important to the planning process. Furthermore, planners or individuals with long-range planning experience often staff them. Thus, their capability is an important resource. Locate the various campus offices that collect, analyze, and archive data and collect appropriate contact information.

Development. The Development Office is an important resource. These units are often involved in developing priorities for institutions and it is important to know where and how support for these priorities is obtained. The Development Office should be represented on the advisory committee. Individuals in this office have experience establishing public-private partnerships. Donations to the university are typically directed at projects the university has determined as priority. Although contributions to specific loss reduction projects are unlikely, capital contributions can be devoted to improving the disaster resistance of the project under consideration. Disaster resistance should be on your development office's list of goals worth promoting.

Public Service and Outreach. In much the same way as the Development Office, a unit dealing with Public Service and Outreach can be an important resource. These units are likely to have extensive information about the surrounding community and can point to existing collaboration between your institution and local, state, and emergency management organizations. They also

represent an important resource to the planning process because they often coordinate the public information aspect of the institution and can solicit and disseminate information through campus newspapers, departmental newsletters, and web pages. Public Service and Outreach can provide resources for developing press releases and can advise the planning committee on strategies for disseminating information on and off campus.

Auxiliary Enterprises. Institutions often conduct a wide range of auxiliary services, such as running a hospital, elementary school, housing and food services, parking, athletics, or related enterprises. These entities should already have an interest in hazard mitigation and should be incorporated in the overall campus planning process. While it may be necessary for these groups to go through the planning process on their own, the overall coordination of plans and the university's responsibility for the safety of its clients and continuity of services is an integral part of the overall mitigation plan. In addition to the direct services these auxiliary units provide, they may also provide a substantial amount of financial support for the institution and an interruption may exacerbate the economic consequences of a disaster to the university or college. Existing emergency operations or disaster plans should be obtained from these units and key contact people should be identified so that their policies and plans are integrated into the campus-wide plan.

Recent Disasters and Universities

On Labor Day 1998, a severe windstorm in central New York State damaged many buildings, trees, and utilities on the Syracuse University campus, forcing the closure of some residence halls and relocation of 600 students. The cost of repairs to roofs, windows, and masonry, as well as a big debris clearance bill, drove the damage figure to more than $4 million.

It is especially important to coordinate three particular administrative units that are important to the hazard mitigation planning process: Public Safety, Environmental Health and Safety, and Risk Management.

- **Public Safety.** Police, fire, and emergency medical services are involved in the initial response to virtually any natural or man-made disaster on campus. They are also an important bridge to local first responders and various emergency management agencies. Depending on the type of incident, they may also be called upon to engage in crowd control during a riot and/or to be responsible for investigating the potential cause of a man-made disaster. Campus police and fire services have emergency plans and standard operating procedures that should be incorporated into the hazard mitigation planning process. Identify appropriate individuals from these units to serve on your advisory committee.
- **Environmental Health and Safety.** Every institution has an environmental health and safety officer, or the equivalent, who is directly involved in a wide range of issues relating to the management of hazards. These individuals are a key resource for providing plans and information regarding the location of various hazards on campus. In many communities, the head of this unit or its designee may serve on the Local Emergency Planning Committee. These individuals are likely to be responsible for filing reports on campus storage and use of hazardous materials.

- **Risk Management.** Most institutions have an office that addresses issues of risk management. This office is an important resource for developing the mitigation plan because it has access to information that can be helpful in the planning process. Furthermore, individuals in this office are committed to the same goals you are—reducing the vulnerability of the institution to hazardous events. In particular, risk managers usually deal with insurance issues where benefit can be gained from comprehensive disaster planning.
- **Telecommunications and Information Systems.** The events of September 11, 2001, reminded us all of the importance of redundant communication systems and off-site backup locations for critical data. From the institutional level down to the individual faculty and staff members, data backup and storage is an important part of ensuring the integrity of the research enterprise and reducing interruptions caused by disaster. Cyber terrorism and other threats to the security of a communications network that higher education institutions depend on emphasize the importance of involving appropriate representatives of this administrative unit in mitigation planning. Their plans and interests should be identified and incorporated at the beginning of the process.

Resources

Environmental Health and Safety Officials have a professional association that is a resource for campus-based hazard mitigation planning. The group holds an annual conference where presentations are made about preparing for, responding to, recovering from, and mitigating natural and man-made disasters. The Campus Safety, Health and Environmental Management Association is a division of the National Safety Council and has web resources and contact information at www.cshema.org.

Risk management is an area where public and private institutions often differ, as private institutions are typically more concerned than public ones about insurance. This is because public institutions are generally self-insured. The University Risk Management & Insurance Association www.urmia.org conducts conferences and seminars for higher education risk managers.

- **Physical Facilities and Project Design and Management.** The long-term goal of reducing the effect of natural and man-made disasters depends, in part, on the willingness of the institution to retrofit existing building stock and to incorporate disaster-resistant design and construction practices into new and renovated buildings. Thus, it is important to identify representatives in this area who shape the institution's built environment.
- **Staff Resources.** In addition to senior administrators, many other staff members in the units described above, as well as in other areas of the campus, spend most of their time ensuring the continuous operation of the institution. In many cases, these people are among the most receptive to a message about risk management. They are, furthermore, typically involved with managing their individual building's safety program and emergency preparedness efforts. Your

Experience

Private universities that carry commercial disaster insurance can obtain extensive information on hazards and risks from the companies they do business with, or from insurance industry information groups. At some institutions, the cost of disaster insurance has become a driving force in the decision to pursue disaster resistance. Private institutions are facing staggering increases in the cost of insurance and the size of their deductibles. Comprehensive hazard mitigation planning and actions will reduce the damage to your institution and reduce reliance on insurance. The hazard mitigation planning effort at your institution should involve appropriate risk management officials.

Mitigation planning and related activities may reduce various types of insurance premiums, including flood insurance through the National Flood Insurance Program. Contact your insurance agent for more information on how mitigation actions might help manage premiums.

For an example of insurance industry efforts to promote hazard mitigation, consult the Web site of the Institute for Business and Home Safety at www.ibhs.org.

inventory should assess whether there are staff organizations that can be a resource to the hazard mitigation planning effort.

Academic Affairs

Many units in academic affairs have a substantial interest in hazard mitigation. Their interest ranges from teaching, and the importance of reducing interruption to the instructional mission of the institution, to the conduct of research and sponsored programs.

Instructional Continuity. Disasters regularly force universities and colleges to suspend their primary activity—the teaching of students. Such closures disrupt the continuity of instruction and limit the ability of the institution to deliver the services that students expect. In dramatic cases, a lengthy interruption can result in the cancellation of a semester and a refund of tuition. These interests are substantial enough that representatives of academic affairs should be contacted and information collected on the individuals who should be involved in the planning process. Since higher education institutions are often decentralized, the inventory should reflect the diversity of academic units at your institution. Prioritization of instructional needs may occur at the school, college, or even departmental level; therefore, several levels of contact may be necessary to ensure that appropriate parties are involved in this process.

Experience

Academic units that often house researchers or teachers with specialization in hazards or emergency planning issues include, but are not limited to: architecture, economics, emergency management, engineering, geography, geology, earth sciences, urban planning, public administration, sociology, and political science. These units represent a good place to start an inventory of faculty resources available on your campus. Use a "snowball" approach and ask the faculty you contact about others they might know who conduct research or teach in this area. Ask those individuals about their work and that of others. In short order a comprehensive list of potentially helpful faculty will emerge.

Faculty Interests. The disaster mitigation plan requires adoption and implementation across a wide range of faculty interests. Unless the discipline of a faculty member makes him or her conscious of the impacts or environmental risks of disasters, professors are unlikely to be interested in these topics. And yet, they stand to lose a great deal if a disaster hits their university and destroys buildings, laboratories, computer systems, databases, books and papers, course notes, and specimen collections. An inventory of faculty members can help identify possible campus resources. Any number of academic units on campus may house faculty members who have teaching or research interests in the area of hazards or emergency management. Identifying these individuals early will allow you to determine the appropriateness of involving them in the planning process; it also provides potential sources of research and technical specialization for the next phases in the process, which include conducting a risk assessment and writing the plan.

In addition to individual faculty members, most institutions have a faculty governance structure that includes committees with jurisdiction relevant to the disaster mitigation planning process. Some duplication of membership on these administrative and faculty committees inevitably occurs. Indeed, your inventory of administrative units probably will generate the names of these committees and you may have already contacted most of them. It is important, however, to complete the circle by ensuring that all faculty-based committees are identified. On many campuses, issues relating

Recent Disasters and Universities

On January 19, 2000, a fire raced through an old residence hall at Seton Hall University in the middle of the night. Students leapt from windows, crawled out stairways, and a number were rescued by firefighters. The fire killed three students, and seriously injured 12 more. The residence hall did not have a sprinkler system.

to instruction may be determined exclusively by faculty committees; thus, they may become an important resource during the adoption and implementation phase of the plan.

Sponsored Programs and Research. In addition to protecting academic instruction, institutions must protect their investment in research and scholarship. A fundamental purpose of any disaster-resistant initiative is to protect the university's research enterprise; therefore, the office at your institution that oversees the conduct of research and sponsored programs is an important resource. This office may have plans, policies, and staff that address the general issue of protecting and limiting the interruption to research at the university. Some institutions have started to recognize the value of disaster resistance and are allocating staff support to positions such as a hazard mitigation research officer.

Moreover, these offices are also under increasing pressure from sponsors of research to ensure the protection and reduction of potential damage to the work they support—including the effects of natural and man-made disasters. The loss of important scientific materials during Tropical Storm Allison in 2001 at the University of Texas Medical Center complex and in the lab fire at the University of California Santa Cruz in 2002 brought renewed attention to the importance of reducing the effects of disasters on the research enterprise.

Student Affairs

Students are often overlooked in the hazard mitigation planning process. However, the safety of students is of paramount concern to the institution and natural and man-made hazards present vexing issues for student safety. Dorm fires, food safety, and evacuation issues all present serious concerns for university and college disaster planners. It is important to identify student services and student-based resources that are important to the disaster mitigation planning process.

Student Services. The division of student affairs or services has various resources important to your effort. Since these units are commonly responsible for on- and sometimes off-campus living arrangements and for food delivery on campus, they have communication plans and building safety information that should be inventoried. When you get to the stage of communicating hazard mitigation information across campus, these units will be very important, and involving them early will facilitate their commitment later.

Student Organizations. Student organizations should be canvassed for potential stakeholders. Student committees often mirror the faculty governance structure and can be important sources of planning information. Students are by far the most difficult campus-based population to reach. While they do not necessarily affect critical campus decisions on risk reduction, they are the objects of it. If they are not aware of how to protect themselves in an emergency, there will be increased losses to life and property. While youth and optimism may make students less aware of risks, the same cannot be said of their parents. Educating students about risk reduction and assuring their parents are part of the disaster-resistant university effort. After September 11, many parents began to raise questions about issues of safety and disaster preparedness that could have been answered, in part, by pointing to the comprehensive planning involved in the disaster-resistant university process. The steps you take to reduce your

Recent Disasters and Universities

On September 24, 2001, a tornado extensively damaged several facilities at the University of Maryland. Instructional and student services space was damaged along with several trailers that were a temporary home to the Maryland Fire Institute. Two students were killed when their car was overturned and classes were canceled for one day.

vulnerability to natural and man-made hazards can reduce the uncertainty parents and students face about the consequences that disasters can have on their safety and investment in higher education.

Alumni. Former students also serve as a potential resource. Alumni may support the goals and program of the disaster-resistant university effort financially, politically, or directly through technical assistance. Work with your development office to identify alumni who may be able to assist you through fundraising and giving for retrofit and modernization projects and those in positions to influence government and nonprofit resource allocation. Alumni may also provide valuable technical resources in areas relevant to your planning efforts.

COMMUNITY STAKEHOLDERS

Off-campus stakeholders are important resources. Government, nonprofit, and private constituencies should be canvassed to identify appropriate resources for your effort. The level of disaster resistance of your institution is directly related to that of your community, region, and state. Collaboration reduces duplication of effort, often yields technical and/or financial assistance, and increases your likelihood of success. The actions of off-campus stakeholders can affect your disaster resistance. Likewise, the actions of your institution in preparing for, responding to, and recovering from an event can affect the disaster resistance and sustainability of the community in which it resides.

Background

Local Government Powers that Apply to Hazard Reduction. *Planning* – Although the degree of planning authority of a local jurisdiction is determined by state legislation, all local governments can use a planning process to educate. *Regulatory Power* – Local jurisdictions have the authority to regulate land use, development, and construction through zoning, subdivision regulations, building codes, design standards, and floodplain regulations. *Spending Authority* – The manner in which local jurisdictions use public funds can influence development in hazard areas. One fiscal management tool that many communities embrace is the capital improvement program, generally a 5-year plan for funding improvements to public facilities. *Taxing Power* – If the private sector encourages development in hazard areas, special taxing districts can be created to balance more equitably public investments. Preferential assessments can be used as incentives to retain agricultural and open-space uses in high hazard areas. *Acquisition* – Local governments can acquire land in high hazard areas through conservation easements and purchase or transfer of development rights.

Government

All levels of government strive to protect public health, safety, and the well-being of its citizens. As such, governments at all levels manage hazards and contribute important resources to organizations that share this purpose. Government jurisdictions commonly overlap those of the institution, and they are among the first responders to any emergency. Collaboration can improve the disaster resistance of all parties and reduce duplication of effort.

Local Government. Local communities and universities are mutually dependent on each other to prepare for disasters and reduce potential losses. Communities are the first to feel the effects of disasters. Local governments are responsible for assembling teams to address natural and man-made threats within the community and to follow a sound planning process for identifying and selecting the best solution for the community. Local governments often have specific statutory authority over your institution. They may have funding resources available and can provide technical assistance to support mitigation efforts. Some specific local government groups to canvass include:

- **Emergency Management**. Depending on your location, the

county or city is primarily responsible for emergency management in your area. Emergency management is still a developing profession and your community may have a full- or part-time emergency manager. In either case, your initial efforts should include contacting this person because he or she is essential in providing resources about disaster preparedness in your area. The local government and the university or college should have a close working relationship since reduction in risk accomplished by one necessarily benefits the other.

Emergency managers are not the only local government entities that should be enlisted, however. Many jurisdictions are now hiring hazard mitigation planners who can be valuable resources and collaborators, and traditional public safety units and state and local planning divisions can also provide data and technical assistance such as mapping. In much the same way that the faculty was inventoried, the capabilities of local government can be assessed by starting with emergency management and working your way out to include others who may be able to assist your effort.

Experience

Many institutions have learned the value of integrating their disaster-resistant university planning efforts with the activities of local government. The University of Miami exemplifies this process. By working with Miami-Dade Office of Emergency Management it has successfully mobilized financial resources through the Local Mitigation Strategy, thus working in collaboration with local government to improve its own and the community's disaster resistance. The University of Miami Director of Environmental Health & Safety serves on the Local Mitigation Strategy Steering Committee and contributes to the local government's mitigation planning activities. By working with local government, the University of Miami has been able to fully realize all of the potential resources that the local, state, and Federal agencies have to offer.

- **Planning.** Community planners have knowledge and skills that are vital to your mitigation planning effort. Planning departments maintain demographic, economic, and physical data on the community. Planners are also usually experienced at meeting facilitation and possess research skills and extensive contacts.
- **Special Districts.** Identify appropriate local schools, park districts, regional government associations, flood control districts, and fire suppression and vegetation management districts to identify potential resources and to engage in partnerships. Park districts may occupy lands near the university and their efforts at risk reduction will complement yours. Vegetation management, erosion control, mapping, and firefighting are obvious ways that the university and special districts can work together. Individuals and staff connected to these districts may possess scientific and technical capabilities that can provide hazard information, technical support, and post-disaster impact data.

Many metropolitan areas have regional government organizations that work on issues such as land use plans, transportation, and housing. Furthermore, regional planning organizations often perform the physical and economic planning functions for multi-county rural areas. These organizations gather data and sponsor planning initiatives to cope with risks; they can be of considerable assistance in providing hazard data to local governments and universities and in conducting sophisticated public information campaigns on risks and how to reduce them.

Infrastructure Providers. Three components of infrastructure warrant special attention in your efforts to identify off-campus resources.

- **Utilities.** Utility loss following a disaster creates serious problems for a community and every home and business in it, including educational institutions. The ability to respond to an

emergency is hampered by the loss of electricity, gas, water, sewers, or telephones, and recovery will be constrained as well until services can be restored.

An interruption to campus utilities may threaten research activities and materials that depend on temperature control, fluid flows, gas, or light. The history of disasters and higher education institutions includes many examples of the damage caused by utility interruptions. Even if the university owns and operates its own utilities, it may require outside assistance to make repairs and restore service. Representatives of these critical lifelines should be identified as resources and involved in your planning efforts because they have access to important information about the security of the utility connections and service at your campus.

- **Transportation.** Roads, bridges, and transit systems are critical to emergency response and business continuity. Extensive damage to transportation systems can leave a campus and its community paralyzed. Transportation specialists can provide important information and resources, particularly at institutions where evacuation is a concern. However, even at campuses where evacuation is not a prime concern, the repair and restoration of transportation systems on and off campus can determine the extent of interruption to the institution's operations.
- **Housing.** Employees' and students' houses, residence halls and apartments may be damaged by a disaster. Losing even a small percentage of the available housing stock can put significant burdens on the university, including the need to shelter displaced employees and students as well as the difficulties that may arise from the need to instruct a student population whose attention and concentration may be diverted by housing concerns. Reducing risks in community housing—owned or rented—should be a high priority for a disaster-resistant university. Student-run cooperatives and Hellenic houses are also important providers of housing. As such, it is in the best interests of the institution to involve appropriate community housing agencies and experts in the process. These individuals may be key resources as the risk assessment is conducted and the mitigation plan is developed.

State Government. The state legislature and assorted agencies play a large role in making financial resources available for increasing disaster resistance, especially if the institution is a

Experience

Sample Advisory Committee Membership
University of Washington:

- Director of Records Management Services
- Executive Director of Health Sciences Administration
- Assistant Vice President for Regional Affairs
- Director of the Institute for Hazard Mitigation Planning & Research
- Disaster-resistant University Coordinator
- Director of Student Activities and Union Facilities
- Director of the Student Health Center
- Director of Purchasing and Stores
- Representative from the Real Estate Office
- Associate Vice President for Business Services
- Associate Vice President for Facilities Services
- Director of Communication Technologies
- Director of University Computing Services
- Assistant Vice Provost for Research
- Chief of the University Police
- Associate Director of University Computing Services
- Director of News and Information
- Lieutenant from the University Police Department
- Associate Vice President for Capital Projects
- Seismology Lab Coordinator in Geophysics
- Director of Academic Services & Facilities
- Director of Environmental Health & Safety
- Representative from University Relations
- Representative from Faculty Council on University Facilities and Services

From the community:

- Program Manager for King County Emergency Services Public Health
- Local risk consultant
- Director of Seattle Emergency Management Section
- Manager of King County Office of Emergency Management
- Local planning analyst

public one. In addition, if the campus is part of a larger statewide system, budget allocations may be controlled at that level. Your inventory should identify resources available from these groups and potential stakeholders.

For both public and private universities and colleges, extensive planning and technical assistance for risk reduction can come from state agencies such as the office of emergency management and departments such as planning, environmental agencies, geological services, water resources conservation, and forestry. There may also be hazard-specific offices such as a seismic safety commission or flood control commission that can assist your disaster-resistant university planning efforts. Additionally, states receive financial assistance from the Federal government to distribute to local entities (including higher education institutions) for hazard mitigation purposes; however, funds are often limited, requiring the state to prioritize their distribution. Thus, it is critical to establish and maintain relationships with state staff that administer these program funds.

States are required to uphold Federal regulations intended to reduce hazard losses, and their role in coordinating hazard mitigation planning has become even more important with the passage of the Disaster Mitigation Act of 2000. A good place to start is to contact your State Office of Emergency Management and State Hazard Mitigation Officer. Local emergency management officials can help you identify this person and may even serve as a liaison to this office. A network of State Hazard Mitigation Officers is maintained at www.hazmit.net.

Federal Government. The most important resource at the Federal level is the Federal Emergency Management Agency (FEMA) within the Department of Homeland Security. FEMA is the lead Federal agency responsible for providing technical assistance to other Federal agencies and to state and local governments for mitigation planning and project implementation. FEMA is leading the implementation of the Disaster Mitigation Act of 2000. FEMA's mission is to reduce loss of life and property and to protect the

Background

Stafford Act/Disaster Mitigation Act of 2000. The Robert T. Stafford Disaster Relief and Emergency Assistance Act (Public Law 100-107) authorizes funding for the Federal disaster relief (including mitigation) programs in place today. The Disaster Mitigation Act (DMA) of 2000 (Public Law 106-390, as amended) is the primary authority for mitigation planning. The DMA amends the Stafford Act Section 409 and provides for a new and revitalized approach to mitigation planning. Section 322 of the Act emphasizes the need for state, local, and tribal entities to closely coordinate mitigation planning and implementation efforts. In addition, Section 322 creates incentives for increased coordination and integration of mitigation activities at the state level. Together, the Stafford Act and DMA 2000 provide an array of funding for planning projects and technical assistance to communities. Below is a partial list of programs authorized by these acts:

- The Pre-Disaster Mitigation Program (PDM) authorized by the DMA 2000, provides funding to states and communities for cost-effective hazard mitigation activities that complement a comprehensive mitigation program, and reduce injuries, loss of life, and damage and destruction of property before a disaster strikes.
- The Hazard Mitigation Grant Program (HMGP) authorized in Section 404 of the Stafford Act, provides grants to states and local governments to implement long-term hazard mitigation actions after a major disaster declaration.
- The Individual and Family Grant Program is authorized by Section 411 of the Stafford Act and authorizes grants after a disaster to cover serious unmet, disaster-related real property losses.
- The Public Assistance Program (PA) is authorized under Section 406 of the Stafford Act. The program provides funding after a disaster for the repair, restoration, or replacement of damaged facilities belonging to governments and private nonprofit entities, and for other associated expenses, including emergency protective actions and debris removal, in addition to funding mitigation actions related to repair of the existing damaged facility.

Both public and private universities and colleges have benefited from the Hazard Mitigation Grant Program and the Public Assistance Program. It is important to familiarize yourself with these programs, their regulatory framework, and the appropriate person in your state who oversees them.

nation's critical infrastructure from all types of hazards through a comprehensive, risk-based emergency management program of mitigation, preparedness, response, and recovery. FEMA is organized into regions and your local or state emergency management officials can put you in contact with appropriate regional representatives who can share with you the resources that FEMA provides for hazard mitigation planning. Many FEMA documents are profiled in this guide; however, technical assistance is also available and should be considered an important resource for your work. Appendix C provides contact information for each FEMA Regional Office.

It is particularly important to become familiar with the variety of existing Federal Disaster Assistance Programs. These programs may provide funding for hazard mitigation actions and/or the repair, restoration, or replacement of facilities at your institution following a disaster.

In addition to FEMA, a wide range of other Federal agencies may be able to provide valuable resources for your work. The U.S. Geological Survey, National Weather Service, National Oceanic and Atmospheric Administration, and the Departments of Energy, Housing and Urban Development, Education, and Transportation, for example, are also potential additions to your inventory. Identify local, state, or regional offices of these agencies and determine the availability of individuals and resources. The FEMA CD, Mitigation Resources for Success (FEMA 372) provides reference information on other federal agency programs that may provide hazard mitigation resources.

Resources

The Federal Emergency Management Agency web site www.fema.gov/fima/planning.shtm contains a great deal of information helpful to your planning effort.

Nonprofit Organizations

Emergency management in the United States has always relied heavily upon nonprofit organizations to engage in disaster mitigation, preparedness, response, and recovery. In particular, your inventory should include resources available from local units of the American Red Cross and Salvation Army. The American Red Cross provides extensive preparedness materials that can be leveraged in your efforts to prepare faculty, staff, and students for possible disasters. The American Red Cross typically runs emergency shelters, so if your campus has a public shelter or will be sheltering your students and employees, it would be wise to involve them in your hazard mitigation planning activities. Similarly, the Salvation Army is important during the disaster response and recovery phases and can provide important resources for temporary housing and feeding displaced students after a disaster. Since many students may live off campus, they are particularly susceptible to displacement by natural and man-made hazards. Nonprofit organizations may be able to assist you in preparing for such a situation. The National Voluntary Organizations Active in Disaster (NVOAD) can provide such information. Please see www.nvoad.org.

In addition to the American Red Cross and the Salvation Army, other local voluntary organizations such as the United Way can provide important resources for your efforts. Early contact ensures that you have the widest possible capability for your effort. These organizations may not provide assistance to the university directly, but those that provide food and clothing, shelter, housing, and medical care can help the community deal with its affected populations. The university should be familiar with local nonprofit organizations and their services and should enter into mutually supportive agreements where appropriate.

Private Sector

The private sector can contribute important resources to the disaster-resistant planning initiative. As with the operations of the local government, business and industry practices in your area help determine the overall disaster resistance of the community, which in turn affects the disaster resistance of the university. This is a symbiotic relationship, as businesses that supply the university and/or serve the needs of students depend on the university being open and operating, and the university's quick resumption of its operations following a disaster will have a favorable impact on businesses in the community. Thus, businesses that contribute to the overall well-being of the community may be willing to provide technical assistance, staff support, and even financial support to the disaster planning effort. Depending on the situation, this technical assistance may be paid for in full or be donated in-kind.

Worksheet #1 in Appendix A will assist you in identifying appropriate partners.

Experience

Sample Advisory Committee Membership
University of California, Berkeley:

- Vice Chancellor for Capital Projects
- Vice Chancellor for Resource Planning and Budget
- Assistant Vice Chancellor for Research
- A dean of Letters and Science
- Chair of the Academic Senate
- Two engineering professors
- One architecture professor
- Director of Business Services
- Director of Emergency Preparedness
- Director of Community Relations
- From the Office of the President, the Assistant Vice President for Facilities services

From the community, there are representatives of the City Manager and two businesses: a small property management company, and the Bayer Corporation. Berkeley was also fortunate to have the participation of its Bay Area neighbor, Stanford University; Stanford Vice Provost brings to the committee Stanford's experience recovering from the 1989 Loma Prieta earthquake, and their ongoing risk management concerns.

FORM AN ADVISORY COMMITTEE

An advisory committee should be established once the inventory of available resources has been completed. The inventory produced a list of potential stakeholders from the institution and the community. Now it is time to begin the process of determining who will help make decisions about the process and who will serve primarily as a resource.

Decisions about how to deal with the effects of hazards on an institution impact all levels of the organization, and stakeholders from the groups described above should be considered for inclusion on the advisory committee. Hazard mitigation involves academic, administrative, and student leadership. Work with, and appoint professionals on the campus who are already involved in emergency preparedness, crisis response, or risk management, but make certain that the committee is made up of people whose views extend far beyond what is typically thought of as emergency services or environmental health and safety.

How large should the committee be? The answer lies, in part, with the size of your stakeholder inventory. If you uncovered a small number of stakeholders, a committee that includes all of them would be satisfactory. If, on the other hand, you

Experience

When choosing advisory committee members, look for people who:

- Possess the ability to command respect across the institution and in the community;
- Are visionary and open to new ideas;
- Have the desire, time, and commitment to support hazard mitigation issues;
- Have the ability to communicate planning and hazard concepts to colleagues and members of the community; and
- Understand, and are able to operate effectively within, the political and administrative environment at your institution.

ended up with a long list of resources, perhaps a two-level organizational structure involving subcommittees and/or workgroups is more appropriate, with the chair of each committee serving on a steering committee. Regardless of the structure that is chosen, the committee that makes the final decisions should be small enough so that members can actively participate and have a sense of ownership, yet large enough to include important points of view and key decision-makers. The committee must be able to build the relationships necessary to facilitate compromise and engender commitments to implement the disaster mitigation plan.

IDENTIFY A COORDINATOR OR PROJECT MANAGER

The project must have a manager, preferably someone with the time and authority to focus exclusively on the activities related to the disaster-resistant university. The project manager provides staff support to the advisory committee and may be housed in a variety of different units on campus. A full-time coordinator is preferable so that he or she can spend the time necessary to understand the full complexity of the situation facing the campus. A part-time coordinator would be less likely to develop and leverage partnerships with the community or to be able to carefully include the variety of campus units that need to be involved. Regardless of the unit the project manager is assigned to, he or she should have access to and support from a senior administrator.

The project manager may come from the campus or be hired from outside. It may be expedient to redirect the tasks of someone familiar with the campus' operations, personalities, and culture. On the other hand, an off-campus specialist in loss reduction may be more effective in a shorter period of time. The ideal situation differs from campus to campus.

The project manager should become involved in the activities of any group on campus that is working on related issues. The projects of those charged with emergency preparedness, risk management, or crisis response are obvious cooperative opportunities, but look beyond them to other initiatives in resource planning, space management, instructional improvements, research facilities, and business operations. Collaborating with faculty, administrative staff, and students on various tasks will allow the manager to introduce the disaster-resistant university concept to others and help to establish a mutually supportive atmosphere.

Authorize the Coordinator and Advisory Committee

Once the membership of the advisory committee has been determined and a project manager identified, a formal endorsement of their composition and work must be obtained. While the chief administrative officer probably will have already announced the institution's commitment to becoming disaster-resistant, it is nevertheless important for the committee members and project manager to get a firm statement of support and an appropriate charge.

The likelihood of success will be enhanced if multiple jurisdictions recognize the planned efforts of this group. In addition to a formal charge from the chief academic officer,

Experience

Depending on your situation, it may be appropriate to identify a project coordinator prior to the inventory and designation of an advisory committee. In other cases, an interim coordinator may be designated to begin the process with the permanent coordinator chosen by the advisory committee. Both strategies have benefits and drawbacks and the decision is likely to be situation- and institution-specific.

endorsement by the faculty senate, staff associations, and student government, as well as local government jurisdictions, can go a long way toward energizing committee members and providing a solid foundation for the next phase of the process.

Establish a Timeline

Once the advisory committee and project leadership is in place, a timeline should be established. The primary phases of this process include *Phase 1, Organize Resources; Phase 2, Hazard Identification and Risk Assessment Study; Phase 3, Developing the Mitigation Plan;* and *Phase 4, Adoption and Implementation.* The process must allow for sufficient time to complete these tasks. Several issues should be addressed as the timeline is established:

- Will the work be done by a committee of the whole or in subcommittees? If subcommittees are used, more time is needed to allow them to organize and develop appropriate work plans.
- Will consultants be hired? Institutions of all types and sizes have successfully pursued disaster resistance on their own, but the process may be slower than if consultants are engaged.
- How many levels of planning will you engage in? Will departments, units, colleges, and divisions be involved in developing individual plans to integrate with the comprehensive effort? The amount of time planned should take into consideration the multiple levels of planning being considered.

Resources

During the first meeting and periodically thereafter, you may want to watch a short video or conduct a "what if" exercise to find out what campus locations or assets may be vulnerable to hazards. You can obtain information on conducting tabletop mitigation exercises and a list of relevant videos on the FEMA Web site or from the FEMA publications warehouse 1-800-480-2520.

Regardless of the answers to these questions, the timeline should expressly detail four events: 1) an informal kickoff, 2) the first formal meeting, 3) development of a mission statement, and 4) development of a communication plan.

Informal Kickoff. The first meeting of the advisory group will probably serve as the informal kickoff. This meeting should generate a sense of teamwork and focus on an introduction of the team members, the purpose of the meeting, and what the team wants to accomplish. The committee's charge should be delivered at this meeting and reviewed regularly throughout the process. The kickoff meeting is an ideal time to publicize the institution's efforts both on and off campus. The inclusion of community stakeholders should be explicitly recognized.

First Formal Meeting. The next important event on the initial timeline is the first formal meeting. The project manager should develop an agenda for the first meeting that includes a review of the charge and how the advisory committee members were selected. Prior to the first meeting, committee members should be designated to fill three vital roles: the chair, a facilitator, and someone to record all of the information. The first meeting should include a brief presentation on recent disasters that have affected the area. The issue of inclusiveness should be addressed and potential stakeholders who were not invited to join should be identified.

Experience

The University of Washington Disaster-resistant University Initiative adopted the following mission statement: "To fulfill the University's mission and commitments in the event of a disaster, the University strives to become disaster-resistant. Disaster resistance is achieved through recognition and analysis of the risks and analysis of natural and man-made hazards, mitigation of the human and economic impact of disasters, and comprehensive planning for resumption of University functions."

Develop a Mission Statement

Perhaps the most important objective of the first meeting is the development of a mission statement to help committee members understand what outcomes they want to achieve. This step can help build a common understanding of the mitigation plan's purpose.

Develop a Communication Plan

It is important early on to decide how and when information *about* the planning process, and information gleaned *from* the process, are disseminated, and to whom. University administrators, faculty, students, parents, and community officials will all take an interest in both the planning progress and the result of the process itself. Knowing when and what type of information will emerge also builds support for the process.

CONCLUSION

Once the initial inventory of resources is complete and stakeholders have been identified, the advisory committee formed, project manager determined, and timeline established, you are ready to move onto the Phase 2—the completion of a comprehensive hazard identification and risk assessment. At this point, the effort transitions from planning to completing a thorough assessment of the hazards the campus faces, the risks they pose, and the institution's vulnerability to those risks.

PHASE 2 – HAZARD IDENTIFICATION AND RISK ASSESSMENT

This section guides higher education institutions on how to conduct a hazard identification and "single-point" risk assessment. A risk assessment identifies the hazards that your campus faces and assesses your level of vulnerability to these potential events. The risk assessment is a crucial step in the hazard mitigation planning process, because this information will be used to identify and prioritize the mitigation actions in your hazard mitigation plan.

In a true comprehensive risk assessment, you would consider all possible hazard events, and determine mathematically the expected damages from the whole range of possible events. In the "single-point" method, you will select one hazard event and determine losses from that single event. While this latter approach is not as rigorous, it provides ample information to determine what should be done to reduce the effects of hazards on campus.

This section closely follows the guidance provided for local communities in the FEMA how-to guide—*Understanding Your Risks: Identifying Hazards and Estimating Losses* (FEMA 386-2). The information below is intended to supplement that document in an effort to provide specific suggestions for the unique situations of colleges and universities. The hazard identification and risk assessment study includes four stages: 1) identify hazards, 2) profile hazard events, 3) inventory assets, and 4) estimate losses.

The activities you perform in this phase will help you answer the questions on the vulnerability questionnaire shown on Worksheet #2 in Appendix A.

Background

Natural versus man-made hazards: The hazard identification and risk assessment should include all potential hazards that face your institution, including natural and man-made threats. The FEMA how-to guide, *Understanding Your Risks: Identifying Hazards and Estimating Losses* (FEMA 386-2) provides information on the most common natural hazards: earthquake, flood, hurricane, landslide, tornado, tsunami, and wildfire. The FEMA how-to guide *Integrating Human-Caused Hazards Into Mitigation Planning* (FEMA 386-7) provides information on the complement of terrorism and technological hazards that may face your institution. These documents should be reviewed thoroughly before beginning your risk assessment.

IDENTIFY HAZARDS

The first step in conducting a hazard identification and risk assessment is to identify the natural and man-made hazards that present risks to your college or university. Start by contacting your local emergency management office and asking them about the hazards your area faces. In addition to your local office of emergency management, the FEMA how-to guide (FEMA 386-2) provides excellent advice on other sources of information about local hazards. Next, consider the unique hazards your institution may face. In particular, you may conduct a hazards history of your institution by using university and local archives to identify disasters that have affected your institution in the past. Conduct focus group sessions with members of your advisory committee and other campus stakeholders to identify what they believe the hazards are and to identify any gaps in your own research.

Possible resources for the hazard identification include: local publications and other historical archives; existing plans and reports; experts at your institution or in your community, state, or FEMA Regional office; and Internet Web sites.

Worksheet #3 (Appendix A) can help you organize this information.

Resources

For information about the hazards your area faces, consult www.hazardmaps.gov.

Prioritize Hazards

After you have developed a full list of potential hazards affecting your campus, prioritize them based on their likelihood of occurrence. This step should not downplay the possibly devastating consequences of a single unlikely event; however, with limited resources, and as a place to start, focus on the hazards *most likely* to affect your institution. The advisory committee or a subcommittee can be useful to engage in this prioritization. Local and state emergency management officials can also provide valuable assistance. If communities adjacent to your campus have undertaken this step, you should consider using all or part of the same prioritized list.

Experience

Conducting a risk assessment requires a wide variety of experts and resources. In preparing for this step you should review the skills, knowledge and abilities of your advisory committee members and canvass other campus resources for possible contributors. Faculty members may already have answered some of your risk questions as part of their own teaching or research activities. Other campus units, such as Facilities, Planning, Environmental Health & Safety, and Risk Management, may possess relevant expertise as well as data that will help in the risk analysis. You should also look to the community and state for help. There, you may find specialists in the city or county government who will help you as part of their jobs, or scientists working for the state department of water or geology. Already established community working groups or committees may have some of the information you need, or they may agree to help you get it. If adequate capacity is not available, seriously consider hiring a consultant to complete the risk assessment.

PROFILE HAZARD EVENTS

Detailed Hazard Profiles

After the initial list of potential hazards has been compiled and you have decided whether to address all or a subset of these events, the next step is to create detailed hazard profiles. This step addresses in specific terms the scope and extent of damage that a particular hazard event could cause to your institution. This is an important step, because determining the type of impact a hazard event will have on your campus can help identify the institution's vulnerable assets.

Mapping

The creation of a campus base map upon which various hazard events can be profiled is the starting point for creating a detailed hazard profile. The FEMA how-to guide, *Understanding Your Risks: Identifying Hazards and Estimating Losses* (FEMA 386-2) explains this process in greater detail. It is important to point out, however, that your geography department or other academic unit with expertise in mapping may be able to create this map for you as a student project or with limited resources. If a member of the geography department is not on the steering committee, contact the department, explain your interests, and inquire about potential help.

Experience

A contractor hired by the University of Miami used information available for a potential flood event related to a hurricane to develop a map that displays the campus facilities that might be flooded or disrupted by road closings or power outages. This map subsequently allowed the university to target those structures for mitigation actions that will lessen the impact of a flood event.

The map should display as many features of your campus as possible. At a minimum, it should show classroom buildings, dormitories, communications and computer facilities, laboratories, offices, libraries, food service, historic and architecturally important structures, parking areas, and any other unique or institution-specific resources. It will also be important to map essential services such as fire, police, emergency communications, emergency operations centers, medical facilities, and shelters, as all of these would be needed during and immediately after a disaster. Locations of items such as hazardous materials and biological agent storage and use areas and animal research facilities should also be noted as this information is critical for local first responders. Finally, the map should illustrate campus lifelines and critical infrastructures such as roads and water, power, communication, and wastewater lines.

The base map should extend beyond the campus boundaries to include campus-related facilities such as residential areas, local fire stations, transportation facilities, and fraternity and sorority buildings. Coordinate this activity closely with surrounding local officials. Placing this map on a geographic information system (GIS) will make it more useful as the project progresses and the data become more complex. GIS can be used to store and access the mapping information, displaying the areas, systems, and functions that are at risk and graphically depicting potentially damaged areas and buildings, costs of repair, and concomitant threats to operations that will assist in setting mitigation priorities. Almost every college and university has GIS specialists within an academic department such as engineering or geography.

Regardless of whether you choose to address each of the hazards you have identified or to narrow your focus from the full range of potential hazards to a subset of the potential threats, the next step is to collect more detailed information. The goal is to identify information, maps, experts, and other resources helpful to beginning the step of

Recent Disasters and Universities

On January 11, 2002, a three-alarm fire broke out in the Sinsheimer Laboratories building on the campus of the University of California Santa Cruz. The fire completely destroyed several labs, including the research lab of Professor Manny Ares, who lost more than a decade of work on the Human Genome Project. Damage from the fire has been estimated at $4-5 million. The building was constructed in 1987, before fire codes required a sprinkler system.

Experience

Universities and colleges are especially concerned with protecting and retrieving documents. Your hazard profile will probably point to the importance of your library, archives, and research data. Over the past couple of decades, numerous library collections and much research have been lost to hazard events. At the same time, a great deal has been learned about how to protect and restore these important resources. Your inventory of hazards and relevant information could contain separate sections for these special or unique institutional assets.

Experience

Information sources at your institution helpful in creating your base map include:

- An accurate listing of all structures on the campus, as well as those that the institution may own on outlying properties, with as much detailed information about the buildings as possible. Typically, a facilities management department holds these data. Determine the amount of space in classrooms, laboratories, offices, libraries, and other facilities, such as convocation spaces. Most institutions have an office that manages the assignment of space to various departments or units. Note that residential and parking structures should be accounted for as well.
- Maps of the campus infrastructure—power, water, sewer lines, and voice and data communications systems. Typically, the managers of the physical plant or facilities management hold these maps.
- Previous assessments of facilities that may have been done for hazardous materials management, deferred maintenance, or for insurance purposes.

evaluating the potential threat of this hazard to your institutional mission. A good deal of attention should be focused on local, state, and Federal emergency management personnel who can assist in providing basic information on the consequences of all of the hazards that have been identified. Particular attention should be paid to resources that may show the impact of hazards on the unique assets of your institution or those of higher education institutions generally.

Use the hazard information and prioritization you generated earlier to create hazard event profiles, or maps. In the beginning, this will involve simple tasks such as delineating a fault zone, floodplain, or storm surge run up zone, but the complexity of your map will ultimately depend on the size of your institution and the hazards it faces. Your maps may later include more complex elements, such as a detailed earthquake shaking map or an analysis of peak flood elevations. When added to the base map, these hazard overlays will create a visual display of how the various hazards could affect your campus and facilities.

Resources

Community Vulnerability Assessment Tool (CVAT) CD-ROM. The CVAT provides guidance on conducting community-wide vulnerability assessments. It also provides a case study demonstrating the process for analyzing physical, social, economic, and environmental vulnerability to hazards at the community level. Some of its aspects could be modified for use by higher education institutions. For more information, visit the NOAA Web site at www.csc.noaa.gov/products.

This effort will be successful only if the campus base map is complete and accurate. Be certain to record and archive all of the information you use to create the hazard event profiles; in addition to safeguarding your work in the event of a disaster, archives may be useful in developing the mitigation plan, and they will be essential to future updates of the risk assessment.

Worksheet #4 (Appendix A) can help you determine how to obtain and record hazard information.

INVENTORY YOUR ASSETS

The third stage of the hazard identification and risk assessment is to conduct an inventory of campus assets in the hazard areas to show how the hazard events you have identified could affect the physical components and operations of the institution. The campus base map and hazard event profiles helped determine *where* hazards can affect your institution; the asset inventory will help determine *what* can be affected.

Experience

Completing the asset inventory may be a substantial task and requires considerable time. The information you need may not be readily accessible, or even available. You may have to consult with numerous campus offices, personnel, experts, etc. and may even need to employ outside consultants on structural, geophysical and other issues. Nevertheless, the inventory is essential to calculating the potential losses and to prioritizing your mitigation actions in the hazard mitigation plan.

The inventory should include information about all of the entities located in hazard areas. Your map already shows where these entities are located; now, they need to be described in sufficient detail so the hazard mitigation plan can be developed. The types of assets and hazards determine, in part, the type of information to be collected. Several

general categories of assets are listed below, along with the types of information about them that will be important for estimating potential losses. You may find additional assets at your institution, and the following guidelines should be modified accordingly.

In conducting this inventory, you may wish to place priority on identifying which facilities are essential or critical to campus operations on a daily basis, and after an emergency. Examples include medical care facilities, emergency services (police, fire, ambulance), information storage, communications, and utilities. Other priority inventory components include historic and cultural resources housed on campus.

Buildings

Describe each campus building in the hazard areas, detailing its size in square feet, type of construction, materials, age, occupancy, maintenance schedule, and replacement and content values. Try to calculate the type and value of activities, operations, and special contents (e.g., sponsored research, instruction, recreation, animals, special collections, and irreplaceable specimens) for each building, as well as any associated capital investments such as equipment. Pay particular attention to any laboratories that may be located in the buildings, describing the laboratory by its research focus, material and equipment contents, and replacement cost and noting the potential for loss or interruption of research and any lab income that could subsequently be lost. There will be certain aspects of the buildings' construction that will be relevant for certain hazards. For example, if flooding is a possibility, pay particular attention to research investments and activities in the basements and ground floors of buildings. The following table outlines these considerations.

Building Data Requirements by Hazard

Building Characteristics	Flood	Earthquake	Tsunami	Tornado	Coastal Storm	Landslide	Wildfire
Building Type / Type of Foundation	✓	✓	✓		✓		
Building Code Design Level / Date of Construction	✓	✓	✓	✓	✓		✓
Roof Material				✓	✓		✓
Roof Construction				✓	✓		✓
Vegetation							✓
Topography	✓				✓	✓	✓
Distance from the Hazard Zone	✓		✓		✓	✓	✓

Describe buildings according to use. Categories may include classrooms, administration, support, research laboratories, libraries and collections, housing and dining, special uses such as gyms and concert halls, parking, and police, fire, and emergency services. Also characterize the occupancy of each building in one of two ways: 1) estimated continuous occupancy (ECO), an annualized average; or 2) typical peak hour occupancy (i.e., an hour between 8 am and 5 pm).

Resources

Content Loss Model for Campus Library: Determine the replacement value of the collections vulnerable to a hazard event and multiply this figure by the expected damage from the event. For example, a library collection valued at $225,000 that is projected to suffer 10% damage from a 100-year flood would have an estimated loss value of $22,500.

Infrastructure

In addition to buildings, describe the conditions and vulnerabilities of utilities and communications systems. Electric, water, and gas systems are essential for campus activities and may be critical to maintaining many types of experiments, and the ability to move about the campus and to communicate via landline, radio, and Internet must be maintained if the campus is to remain fully operational. Additionally, assess the condition and vulnerabilities of all backup systems.

Finally, administrative systems (payroll, accounts payable, student records) are critical to continued operations. Find out where they are located and how vulnerable they are. Determine the vulnerability of your important data and associated functions and what type of backup plan is appropriate.

Experience

The University of California, Berkeley has developed a loss estimation methodology for the potential disruption of an earthquake to their University and the associated impact of that interruption on the surrounding region. A report entitled: *The Economic Benefits of a Disaster-resistant University: Earthquake Loss Estimation for UC Berkeley* can be found at www-iurd.ced.berkeley.edu/pub/WP-2000-02.pdf

At this point you should have sufficient information on the hazard events that could impact your institution and on the assets and operations that could be affected. This will help you determine how to begin mitigating potential damage and will provide you with a complete understanding of the overall risk your institution faces from hazards. It is important to emphasize that for the steps just described, FEMA provides considerable information developed for communities that can be modified to fit your needs (see FEMA 386-2).

Worksheets #5 and #6 in Appendix A can help you determine the extent to which particular hazards would affect the various elements of your institution. Categories shown are simply examples of how you may wish to break out the different types of buildings on campus. Consider tailoring the worksheets to meet your situation.

ESTIMATE LOSSES

The fourth step of the risk assessment is the estimation of the potential losses your institution could face from a specific hazard event. The purpose of this step is to describe how your institution's assets will be affected by a hazard event. During this step, you create scenarios that estimate the impact of an event on people, buildings, and infrastructure. Some of these entities will be more vulnerable than others, and your estimates of losses will vary depending on factors such as the age of the building, type of construction, and time of the event. In many cases, it has been useful to develop a number of different scenarios that vary by hazard event and expected impact.

Communities typically express their expected losses in dollars, and representing risk in economic terms can make a compelling case to administrators and others responsible for hazard mitigation policy at your institution. However, while dollar estimates are often required for community, state, or Federal assistance, the nature of higher education institutions suggests that other descriptions of losses may be appropriate. Lost instructional time, research equipment, data, and subjects, along with unique historical artifacts and library collections, should not only be

quantified but also described in such a way as to communicate the potential human and social costs of failing to reduce risk before disaster strikes.

In a traditional loss estimation process, three types of potential losses are considered: life, property (structure and contents), and function. However, due to the unique characteristics of many institutions' assets, you may also decide to develop separate loss function models for special equipment or research facilities that are particularly vulnerable. The basic formula for calculating loss to an asset is the replacement or interruption costs multiplied by the percent of the asset expected to be damaged from an event. The overall projected loss from a hazard event is expressed as the sum of the appropriate loss equations. Additional information on conducting loss estimates is available in the FEMA how-to guide *Understanding Your Risks: Identifying Hazards and Estimating Losses* (FEMA 386-2). You should be able to estimate structural, content, and functional use equations for each asset. Combined, these estimates provide a complete picture of the economic and financial vulnerability of your institution to various hazard events.

The asset inventory and hazard event profiles will provide the necessary information to develop detailed loss estimates for each structure and function at your institution. Ideally, all of this information should be collected in a common format and mapped using GIS. A composite loss map that combines the individual hazard event maps to determine the most vulnerable campus areas can then be created. While quantifying losses of information and operations may appear challenging, local, state, and Federal emergency management officials have been dealing with the complex issue of establishing loss estimates for years and they have a lot to offer as you work on loss estimates for your campus. You will probably discover that your institution has much in common with communities and that the general guidance FEMA provides to communities often is applicable to the needs of your own institution. Loss estimation tables for floods, earthquakes, and coastal storms, as well as guidance for estimating losses from other hazards, are available in the FEMA how-to guide referenced above.

You may also consider developing estimates of the impact that an interruption in your institution's operations would have on your community and the surrounding region. The local economy is affected by your institution's presence and spending, so capital costs (repair and replacement), student expenditures, faculty and staff salaries and benefits, and other measures of institutional economic activity should be highlighted in this calculation. Documenting this impact will demonstrate the degree to which the community is dependent on your institution, and it will help you in your efforts to mobilize the local community and to build support for your disaster mitigation effort.

Worksheet #7 (Appendix A) can help guide you in calculating the dollar value of losses to individual structures on campus. You can use a separate worksheet for each hazard you wish to evaluate.

Recent Disasters and Universities

In September 1999, Hurricane Floyd pounded North Carolina, causing serious flooding at East Carolina University in Greenville. The campus was surrounded by water for weeks. The university was only partially operational, and some students were forced to lodge with residents in the town.

CONCLUSION

Assessing your institution's vulnerability to natural and man-made hazards can be a challenging exercise. Imprudent decisions that your institution may have made in the past most likely will be revealed. It will take real effort to keep

everyone focused on the long-term goal, but this is essential if you plan to take hazard mitigation seriously. A thorough analysis of the hazards that affect your institution, a profile of potential events, an inventory of the institution's assets, and an estimate of potential losses are necessary before a mitigation plan can be written and your needs can be prioritized. Even if mitigation actions are not immediately forthcoming, a risk assessment and vulnerability study will benefit your institution in many ways. By recognizing the hazards your institution faces and estimating potential losses from these events, your long-range planning efforts will improve and your institution will be more likely to make strategic choices that incorporate the principles of disaster mitigation.

Once the hazard identification and risk assessment are complete, you are ready to write your mitigation plan. The risk assessment will provide you with the information necessary to identify and prioritize mitigation actions based on the vulnerability of your institution; after determining and prioritizing appropriate mitigation actions, you can begin securing support and implementing the plan.

The third phase in the hazard mitigation planning process is writing the hazard mitigation plan itself. The plan should naturally flow from the hazard identification and risk assessment study completed in Phase 2 and should complement the related plans identified in Phase 1. The purpose of the hazard mitigation plan is to lay out in detail the proposed prioritized mitigation actions and to establish their appropriateness and expected utility. Once the plan is complete, it will have to be adopted and implemented by appropriate institutional representatives; therefore, as with the previous phases, it is very important to involve as many stakeholders as possible when writing the plan.

As with the previous steps, consult *Developing the Mitigation Plan: Identifying Mitigation Actions and Implementation Strategies* (FEMA 386-3) for general guidance on this topic. In addition, work closely with local, state, and Federal emergency management officials to ensure that your plan allows you to be fully eligible for all available pre- and post-disaster funding.

Resources

The mitigation plan should:

- establish goals and objectives aimed at reducing or avoiding vulnerabilities to the identified hazards;
- identify actions that will help you accomplish the established goals;
- set forth strategies that detail how the mitigation actions will be implemented and administered;
- provide continuity to the planning process as it provides a link between determining what your community's risks are and actually implementing mitigation actions; and
- establish a process for regular updates and review of the plan.

The FEMA how-to guide *Developing the Mitigation Plan: Identifying Mitigation Actions and Implementation Strategies* (FEMA 386-3) covers this process in detail and should be reviewed before you start to write your plan.

PRIORITIZE FOCUS AREAS

Before beginning to write the plan, conduct a careful review of the conclusions reached by the hazard identification and risk assessment study. Develop mitigation goals and objectives based upon your understanding of problems revealed through the risk assessment.

Background

Clear goals and objectives provide a framework for making decisions on funding and implementing mitigation actions.

The mitigation plan should address all of the hazards you identified and should prioritize them based on your institution's vulnerability to particular natural and man-made hazards. Prioritizing your mitigation focus areas involves comparing the institution's mission with the results of the hazard identification and risk assessment to rank mitigation needs according to their associated risks. This process should be as inclusive as possible, with the involvement of all the appropriate stakeholders. Prioritizing the areas you will focus on should not be viewed as giving less attention to one particular hazard or area

Background

Goals are general statements of what you want to achieve. They are usually long term and represent global visions, such as:

- Minimize interruption to the instructional mission of the university or college.
- Protect the research enterprise on campus.

Objectives define strategies or implementation steps to attain the identified goals. Unlike goals, objectives are specific and measurable, such as:

- Inform the campus community about potential hazards and appropriate loss reduction actions.
- Protect lab equipment valued at $5,000 or more.

Mitigation Actions are specific activities that will help you achieve your goals and objectives. For example:

- Sponsor a campus hazards segment in the administration newsletter.
- Retrofit lab equipment with appropriate protection.
- Develop a training session for new lab directors on hazard mitigation.

of the campus, but rather as a systematic effort to target resources toward reducing the greatest potential threats to the institution's instructional, research, and public service operations.

Background

It is likely that funding for which your institution might be eligible through DMA 2000 will be granted in several small increments over time rather than in a single lump sum. Having your mitigation actions ranked in order of priority allows you to begin implementing the most important actions as funding becomes available.

DETERMINE APPROPRIATE MITIGATION ACTIONS

Once your focus areas have been determined, it is time to identify appropriate mitigation actions to protect your institution's people, facilities, and research. These actions can range from simple and inexpensive, such as securing lab equipment, to complex and expensive, such as structural design improvements for new construction and the retrofitting or relocation of existing structures. The early stages of this process should include an investigation of the full range of appropriate actions, and the initial inventory of appropriate mitigation actions should be done without regard to cost and benefits.

Experience

Urge academic units to safeguard important research documents and specimens and to make duplicate copies of reports and store them separately from the originals.

This guide is not intended as a complete resource for mitigation actions appropriate to natural and man-made hazards. Consult the appropriate how-to guides and experts in this area for that information. This guide is, however, appropriate for considering examples of some basic mitigation actions for common hazards and for providing some details regarding their application to the unique situations of colleges and universities. Many mitigation actions that can reduce losses due to natural hazards can also help reduce the effects of man-made hazards; for example, strengthening windows to reduce wind hazards or strengthening buildings to resist seismic forces may also help mitigate blast forces.

Some common actions taken to reduce the damage from future earthquakes, high winds, fires, and flooding include:

- **Earthquakes**: installing steel moment frames, shear walls, and cross bracing; strengthening floor systems; reinforcing walls with shotcrete/fiber materials; reinforcing columns with fiber wraps/steel jackets; addition of tension/shear anchors and vibration dampers; bracing of bookshelves and other high mounted items; upgrading of utilities; and securing of expensive research equipment.
- **High Winds:** implementation of warning systems and safe rooms; reducing or eliminating openings; reinforcing window glass and frames; strengthening exterior elements to

Background

Six broad categories of mitigation actions include:
1. **Prevention** – Actions such as planning and zoning, open space preservation, , soil erosion and sediment control.
2. **Property Protection** – Actions such as relocation, storm shutters, flood barriers, flood insurance, and structural retrofits.
3. **Public Education and Awareness** – Actions such as outreach projects, hazard information centers, and technical assistance.
4. **Natural Resource Protection** – Actions such as erosion and sediment control, stream corridor protection, and wetlands preservation.
5. **Emergency Services** – Actions such as hazard threat recognition, hazard warning, emergency response, and protection of critical facilities.
6. **Structural Projects** – Actions such as revetments, high flow diversions, spillways, retaining walls, and storm sewers.

resist positive/negative air pressures and impact; improving roof-wall-foundation connections; improving roofing materials; adding/reinforcing shear walls; vegetation management; installation of shutters or window film.

Resources

A compilation of mitigation resources and success stories is available from FEMA on a CD: *Mitigation Resources for Success* (FEMA 372).

- **Fire:** improvement of sprinkler systems; increased use of fireproofing and/or fire-resistant building materials; training of permanent/and or volunteer staff in firefighting techniques; ensuring adequate water supplies for fire protection; vegetation management; maintaining site setbacks.
- **Floods:** elevation or floodproofing of buildings; drainage improvements and structural works; moving critical uses (communications, library and other collections, offices) to higher locations; elevation of vulnerable equipment and research subjects, book collections, art, etc.
- **All Hazards:** Installation or improvement of backup systems (electric generators, computer databases, etc.); implementation of contingency procedures; maintenance of emergency plans (required by USDA for Federally funded research facilities using laboratory animals); informing campus personnel of risks and mitigation strategies; keeping detailed information current regarding hazardous chemicals, biological and radiological agents, laboratory animals, and critical works of art and cultural treasures.

Experience

Researchers at the University of California, Berkeley are developing equipment-specific, custom-designed retrofit actions for the equipment they have identified as vulnerable to an earthquake. The process includes consulting by engineering faculty, graduate students, physical facilities representatives, and appropriate construction sciences personnel to design and implement these actions. As a result, valuable equipment that is critical to the continuation of the research enterprise at the institution will suffer less damage in the next earthquake. Seismic Protection of Laboratory Contents can be read at www-iurd.ced.berkeley.edu/pub/WP-2003.pdf

The mitigation actions listed above are but a few of the actions that can be taken. Reviewing existing literature, asking experts, reviewing success stories, and brainstorming can identify more mitigation actions. Additionally, the FEMA how-to guide *Developing the Mitigation Plan* (FEMA 386-3) contains an extensive list of mitigation actions for natural hazards, and *Integrating Human-Caused Hazards Into Mitigation Planning* (FEMA 386-7) outlines mitigation actions for man-made threats. The advisory committee or subcommittee should collect information on all of the options available to reduce your institution's vulnerability. As larger numbers of higher education institutions work toward disaster resistance, a body of knowledge and best practices will emerge about how universities and colleges have adapted and created mitigation actions to meet their unique requirements. This is still a very new area for many institutions and it will be helpful to document what you do and to share your experiences with others whenever possible. The professional associations listed throughout this guide, as well as FEMA, will be interested in assisting you as well as hearing about your efforts.

Experience

A recent drainage ditch improvement at the University of North Carolina at Wilmington will reduce the risk of ground floor flooding from a hurricane in a building that contains animal research subjects. The mitigation measure was identified after an assessment of previous flooding levels from hurricanes and of the vulnerability of the research that is conducted in the nearby buildings.

PRIORITIZE MITIGATION ACTIONS

As discussed previously, the hazard mitigation plan should identify mitigation focus areas and describe the prioritization of actions within each area. After using the hazard identification and risk assessment study to determine vulnerability and identifying appropriate mitigation actions, rank the actions needed and develop a timeline for implementation.

Recent Disasters and Universities

In July 1997, the Colorado State University campus was flooded by a local creek. Water poured into both the library and the bookstore, damaging hundreds of thousands of books and other valuable documents. Most of the campus was closed for 1-2 weeks while clean up was underway. Damages exceeded $100 million.

Possible criteria for ranking include life safety, operational criticality, time needed to complete the activity, effectiveness/lifespan, or other hazard-specific considerations. However, the most common basis for prioritization is benefit-cost analysis (BCA), which allows multiple projects to be compared across a range of hazards. The basic formula includes the following:

- The cost of the mitigation action;
- The dollar value of risk reduction (calculated from the potential loss of life, property, and function of the institution) each time the hazard occurs;
- The frequency with which the benefits of the action will be realized (frequency of hazard occurrence assumes that the action performs as expected); and
- The present value of aggregated future benefits (dollar value of risk reduction each time the hazard occurs multiplied by the probability of occurrence, multiplied by the life span of the action).

To prioritize mitigation actions, you may create a matrix using multiple criteria of your choosing or simply use benefit-cost analysis. Some institutions hire consultants to develop or apply a methodology for ranking mitigation actions and to assist them in comparing various mitigation actions across different hazard events. In addition to the campus-based experts you have identified, emergency management officials can also help you determine appropriate strategies for prioritization. Whichever method is selected, it is important for all campus stakeholders to understand the process that was followed to determine the rankings and to feel as if they had an opportunity to participate in the process, so be sure to provide adequate opportunity for input from the advisory committee and stakeholders.

Worksheet #8 (Appendix A) can be used to help you track various mitigation options and corresponding issues, as well as priority considerations.

PREPARE AN IMPLEMENTATION STRATEGY

In this step, you will determine how mitigation actions will be funded, who (as in which institutional department) will be responsible for overseeing the project(s), and how long the project(s) should take to complete. An example format for this information is shown in the previous box.

Example Implementation Strategy Format

Action: (from your list of selected actions)
Goal(s) and Objectives Addressed: (Sometimes the action will address more than one goal and objective)
Lead Agency/Department: (Provide the name and a brief description of each support agency)
Budget: (Provide the dollar amount or an estimate, if known)
Funding Source(s): (List the funding source(s)--e.g., operating budget, xyz foundation, etc.)
Start and End Dates: (Indicate start and end dates; short-term, long-term, or ongoing; and milestones for longer term projects)

ASSEMBLE THE PLAN

Once the priorities have been established and the appropriate mitigation actions determined, it is time to assemble the plan. As pointed out earlier, review the FEMA how-to guide *Developing the Mitigation Plan* (FEMA 386-3) and share your plan with appropriate local, state, and Federal emergency management officials. The basic template provided in the adjacent sidebar can be modified to your institution's needs.

CONCLUSION

The hazard mitigation plan documents the ways in which your institution will reduce its vulnerability to natural and man-made disasters. The plan details the purpose of the planning effort, the process that was followed, and the actions that need to be taken. Once the plan is finalized, the next step is to get it adopted and implemented. Plan adoption refers to getting the plan formally approved by the appropriate on- and off-campus entities, and implementation refers to the ongoing effort to perform the mitigation actions, tracking their progress, and measuring their impact. Adoption and implementation of the hazard mitigation plan are discussed in the next section.

Resources

HAZARD MITIGATION PLAN CONTENTS:

Executive Summary
- Purpose
- Process Followed
- Major Recommendations

Goals and Objectives
- Disaster Resistance and University Mission

Hazard Identification and Risk Assessment
- Hazard Background of Institution
- Asset Inventory
- Loss Estimation

Mitigation Strategy
- Identification of Mitigation Actions
- Description of Prioritization Methodology Used (e.g., Benefit-Cost Analysis)
- Prioritization of Actions
- Timeline

Implementation and Plan Maintenance
- Organization and Responsibility for Mitigation
- Integration with Local and State Hazard Mitigation Plans
- Maintenance of Plan and Update Schedule

Resources

As a result of the heightened level of interest in the vulnerability of American communities to terrorism following the attacks of September 11, 2001, your community is likely to be keenly interested in efforts to protect people, buildings, and operations from terrorism and technological disasters. This presents both benefits and challenges, because much of the same information that can be used to rally support for mitigation can also be of use to potential terrorists, saboteurs, or others with malevolent intent. For that reason, you must carefully maintain the security of any information that pertains to vulnerabilities, security measures, and response plans. Your institution's legal counsel should be able to provide guidance on how best to protect such sensitive information within the provisions of applicable freedom of information laws.

For more information on information sensitivity, refer to the FEMA how-to guide *Integrating Human-Caused Hazards Into Mitigation Planning* (FEMA 386-7).

Resources

University of California, Berkeley's risk management plan can be found at www-iurd.ced.berkeley.edu/pub/WP-2000-03.pdf

PHASE 4 – ADOPTION AND IMPLEMENTATION

The final phase in the disaster-resistant university process is the adoption and implementation of the mitigation plan. Adoption and implementation go hand in hand. They may happen simultaneously, but they are discussed separately here to emphasize the unique aspects of both steps. Adoption is a relatively short-term and straightforward process. Implementation, on the other hand, is a long-term and complex process that requires the consistent review, coordination, and completion of mitigation actions.

Background

Adoption refers to the formal and informal acceptance of the plan by appropriate entities, such as a formal vote or a statement of support or memorandum of understanding. **Implementation** refers to putting the plan into action by taking steps to adopt the mitigation actions described in the plan.

ADOPTION

On Campus

Once the plan has been completed, it should be presented to the chancellor or president of the university for review and formal adoption. To ensure success, disaster-resistance efforts require the support and endorsement of the institution's chief operating officer. The president or chancellor must be a visible spokesperson for the effort. After the president or chancellor has endorsed the plan, the key stakeholders on campus identified in *Phase 1- Organize Resources*, some of whom have probably been on the advisory committee or involved in other ways in the process, should be consulted and asked to adopt the plan.

Experience

At some point it will be important to publicize the university's efforts by holding a press conference to announce your work. This process can begin with the formal announcement of the plan's completion with a high profile signing by various senior university officials. Your effort to make it clear to the rest of the institution that support for the plan comes from the top will enhance the likelihood of implementation at all levels.

Institution-Wide Governance Body. After the chancellor or president has adopted the plan, it should be submitted to the appropriate institution-wide governance body. These bodies go by many names, such as Board of Trustees, Board of Overseers, Board of Visitors, etc. Your institution may have more than one such oversight organization. Identify the appropriate steps to have your plan endorsed at this level. These bodies have the final say over financial, personnel, and student matters at many institutions and therefore are very important to implementation. They should be kept informed of the status of disaster-resistance efforts on campus, informed of the plan's completion, and asked to adopt it.

Administration. Administrative units identified in *Phase 1: Organize Resources* should be asked to endorse the plan. The advisory committee may consider developing a formal memorandum of agreement that reflects the commitment of each unit to the principles of disaster resistance and to the strategies detailed in the mitigation plan. The committee should focus on getting the chief business officer to emphasize to the various business affairs units the importance of adopting the plan. Adoption of the plan by all public safety divisions and environmental health and safety divisions is critical.

Additionally, risk management, auxiliary services, and even the admissions office will be important in the successful implementation of the plan and should be asked to formally endorse it.

The admissions office may not seem like the most obvious candidate for the adoption of mitigation actions, as there is not a lot they can do to make your institution more disaster-resistant. However, the admissions office does have a key stake in the adoption and implementation of a comprehensive plan—namely, the recruitment and retention of your institution's primary customers. Students choose colleges and universities for many reasons, and there is little doubt that safety is now more important than ever. A formal statement of how your institution is working to become disaster-resistant can help the admissions office to promote these efforts to potential students.

Experience

Depending on the nature of your institution, it may be necessary to send your plan to additional organizations. It is common among state funded institutions to have a statewide or system-wide governance structure that provides overall policy guidance for some number of schools in the state. While it may not be necessary to get their formal endorsement of the campus plan, it is certainly appropriate to make them aware of your efforts to reduce the loss of life, damage to property, and interruption to your institutional mission that would be caused by a disaster.

Academic Affairs. The plan should be adopted and endorsed by the chief academic officer of the university. The various levels of approval in the area of academic affairs should have been identified in Phase 1. It is common for the academic affairs structure to be more complicated than business affairs. As such, depending on the structure of your institution, it may be appropriate to get plan approval by the individual schools, colleges, and departments. Some academic units will be more involved than others as you work to implement the plan; in particular, departments that use hazardous materials, conduct research in sensitive areas such as genetics or animal sciences, and those with unique physical security concerns should be involved in the plan and asked to endorse it.

Sponsored Programs or Research Administration. Protecting the institution's research enterprise and knowledge generation resources is an important reason for becoming disaster-resistant. In *Phase 2: Hazard Identification and Risk Assessment*, threats to the research enterprise at your institution were identified. The office of sponsored programs or research administration is generally charged with oversight of sponsored research on campus. They can coordinate initiatives to ensure that research is done in an environment that is as resistant as possible to hazards, including training on hazard mitigation strategies for new principal investigators, lab management personnel, and others involved in research, data collection, or retrieval. As noted in Phase 1, sponsors are increasingly asking about appropriate protections to ensure the integrity and protection of the work they are supporting. Involving this unit and obtaining their formal endorsement will strengthen your efforts to demonstrate the importance of the initiative.

Student Affairs. The student services divisions and organizations identified in Phase 1 should be contacted and asked to endorse the plan. Recognizing that student safety is of paramount concern, several of the mitigation actions detailed in the plan will probably have an effect on students and the way they interface with the institution. Students and organizations that have influence over issues such as building and residence hall security, the handling of hazardous materials, and the evacuation of campus before or after a disaster should be involved in this process.

Recent Disasters and Universities

The 1989 Loma Prieta earthquake damaged a number of buildings at Stanford University, closing 11 of them. After spending about $300 million over 10 years on repairs and retrofits, Stanford has finally reopened most buildings.

The approval and endorsement of on-campus student governance organizations is particularly important. In addition to demonstrating that the vision of a disaster-resistant university is shared across the entire institution, student government organizations may have access to, or the ability to raise, funds that can be tapped to support the work detailed in the disaster mitigation plan. To the extent that retrofitting existing structures or the incorporation of disaster-resistant building technologies is required on buildings that are maintained or built with student fees, these organizations can provide critical support.

Off Campus

Off-campus stakeholders identified during Phase 1 are equally important to plan adoption and implementation. Regardless of whether they were involved in developing the plan, they should be sent a copy and asked to endorse its contents in a memorandum of agreement. This step reaffirms that your institution and community are inextricably linked when it comes to disaster mitigation. Several groups, in particular, should be sought out to endorse the plan.

Emergency Management/Hazard Mitigation Planning. It is particularly important to get the endorsement and support of your local office of emergency management and/or local hazard mitigation planner. In many jurisdictions, the local emergency management jurisdiction has never reviewed the campus emergency/disaster plan. Your committee already began to correct this important oversight when emergency management staff were invited to become an active participant in this process. The approval of and coordination with those responsible for emergency management and hazard mitigation for nearby jurisdictions is crucial, especially because funding for pre- and post-disaster mitigation is usually coordinated with the state through local jurisdictions. They cannot be expected to make informed requests to the state on your behalf if they are unaware of your vulnerabilities and your priority for mitigation actions.

Public Safety/First Responders. In much the same way that the local emergency management agency was consulted, first responders–police, fire/rescue, and emergency medical services–should also be asked to review and endorse the plan. Depending on your location, these organizations may not be directly involved in hazard mitigation, but they will be among the first on the scene should a disaster occur at your institution. Therefore, it is important for them to be informed of your plan and of any mitigation actions that may affect their ability to respond or that could change your institution's response requirements.

Recent Disasters and Universities

In July 1999, a heat wave resulted in a sustained power outage in New York City. The electricity went out at Columbia University and was not completely restored for 2-3 days. In the intervening time, researchers at Columbia's College of Physicians and Surgeons lost irreplaceable research materials—human tissue, enzymes and cells—because there were not sufficient back-up generators to keep freezers or incubators running. Damages to the $200 million research program were calculated at many millions of dollars.

Local Political Jurisdictions. It may be appropriate to ask local political jurisdictions to formally endorse your plan, depending on your institution's relationship with them. A proclamation or other device to recognize your work and show support for disaster resistance can often accomplish this. If your community has a local hazard mitigation planning initiative underway, your efforts will demonstrate to the community your sincere contribution to sustainability. Political jurisdictions can reciprocate by giving enhanced credibility to the integration of college and university planning with local efforts to make the community safer. University faculty, staff, and students are citizens of the community

and disasters that affect them strain the entire community. Mitigation actions can reduce that burden.

Private Industry. It may be appropriate to ask some of the private industry representatives that were involved in the planning process to consider endorsing the final product. Having them formally recognize the plan has two advantages. It increases the likelihood that they might assist you with in-kind donations of goods necessary for some of your mitigation priorities—perhaps even funding or supporting your fundraising efforts for others. It also demonstrates to your institution's leadership that the disaster mitigation effort has successfully involved many segments of the community. Some private industry stakeholders are more likely than others to be interested in joining forces with the university, but a good place to start is with those identified in Phase 1 and other appropriate industries with an interest in hazards or disasters.

Experience

Not every mitigation action requires significant additional resources. The **University of California, Berkeley**, as part of its disaster-resistant University program, decided that lab resistance to seismic activity was an important mitigation goal. Reducing the vulnerability of research labs to earthquakes was one of its objectives. The planned mitigation action relied simply on proper storage and security of chemicals, the physical stability of expensive equipment, and the safety of lab personnel from overhead hazards. The mitigation strategy took advantage of graduate and undergraduate students to conduct a survey of lab vulnerability and to subsequently implement actions that will reduce the damage to people, equipment, and research during the next earthquake.

At the **University of North Carolina at Wilmington**, knowledge from a Cooperative Extension service agent who was a specialist in hurricane-resistant landscaping was incorporated into campus landscaping. Thus, without requiring any additional funds the institution's tree and shrub stock will be less likely to be damaged during the next hurricane.

IMPLEMENTATION

Once the plan has been written and adopted, it must be implemented. A disaster-resistant university is continuously striving to reduce the damage caused to its institutional mission by the next natural or man-made disaster. Putting the plan in place requires attention to coordinating the effort, identifying funding streams, and monitoring progress over the long term.

Coordinating the Effort

An advisory committee and coordinator were necessary to make the planning effort happen. Their responsibility now shifts to coordinating and overseeing the implementation of the plan. Implementation means achieving the identifiable, measurable outcomes described in the plan. This may require an adjustment to the membership of the committee, or a subcommittee may assume this responsibility. In either case, the membership of the committee must be re-assessed for appropriateness as the process moves to implementation.

The coordinator and committee should develop an implementation strategy. The implementation strategy lays out the mitigation actions and their priority, but it does not describe your plan for carrying out these actions. Thus, the focus now shifts to the steps necessary to bring about these mitigation actions. Questions the committee should address in preparing the strategy include:

- Which unit of the institution (e.g., physical plant, buildings and grounds, instruction, academic affairs, a particular college or department, etc.) will the actions affect?
- Who are the people in those units that will be responsible for implementing the actions?
- What resources are available to support implementation of the actions?
- Can implementation be accomplished with existing resources?

- If not, what additional resources will be required?
- What is the timetable to complete the actions?
- How will the effectiveness of the activities be measured?
- What is the timetable for periodic review of the actions' efficacy?

Funding the Projects

Many mitigation actions can be completed with existing resources. However, the coordinator and advisory committee should work with senior administrators to identify sources of funding for projects if existing resources are insufficient. Those working to secure funding should think creatively, regardless of the size of the project. You have worked hard to establish hazard mitigation as a priority on campus and have justified mitigation in terms of economic and life safety, but you may still have to aggressively pursue funds.
Several sources of funding exist:

Recent Disasters and Universities

In 1998, Hurricane Georges prompted the closure and evacuation of Tulane University. Ultimately, the hurricane did not hit New Orleans, but Tulane's risk management practices dictated early evacuations to protect the university community's safety.

University or System. Identify whether university resources can be redirected from another area to meet your needs. Assistance from the business affairs office can help determine whether this is possible. If the advisory committee and coordinator have been effective at obtaining the support of the chancellor or president, disaster mitigation may be prioritized in such a way that when revisions are made to strategic plans, funds will be redirected to disaster mitigation. This may be politically divisive, but the conflict will be minimized if the entire university community has been kept apprised of your efforts and senior administrative officials are supportive. It is important to coordinate your efforts with other strategic and long-range planning efforts on campus. Institutional priorities are established in these plans, and you should be involved in the appropriate planning processes in order to secure funding. There should be some duplication of membership across the disaster-resistant university steering committee and other long-range planning initiatives on campus.

Resources

Additional information about potential funding sources for natural hazards mitigation can be found in the FEMA how-to guide: *Developing the Mitigation Plan* (FEMA 386-3). For potential sources of funding for man-made hazards mitigation, consult the FEMA how-to guide: *Integrating Human-Caused Hazards Into Mitigation Planning* (FEMA 386-7).

If your institution is located within a system, public or private, you also need to consider resources available at these levels. Depending on the mitigation action you are pursuing, the system may be more or less inclined to support your efforts. For example, the retrofit of existing structures and the incorporation of hazard-resistant building technologies are more likely to get support at the system level than something that is unique to a less enduring aspect of the institution, such as lab retrofits. It will be easier to obtain funds for your effort if your system is aware of and endorses your plan. However, it is worth noting that disaster resistance can only be achieved with some contribution by your own institution. Some financial commitment must be present if you hope to successfully leverage the additional funding streams detailed below.

Local Government. Local governments are an important place to begin your search for funding, because even if they do not become a source of funding, their support may be required to secure funding from other levels of government or private sources. Additionally, funding for mitigation

actions may be available at the local level, because although local governments are often required to "do more with less," sometimes surplus funds do become available. You are more likely to be made aware of possible funding and to secure it when it becomes available if you have worked closely with local emergency management personnel on the development of your plan and securing their formal endorsement. When coordinating your mitigation priorities with those of your local jurisdiction, emphasize the fact that major mitigation actions contribute not only to the disaster resistance of your institution but also to the overall well-being of the community.

State Government. State government can be an important source of mitigation funding. For public institutions, state appropriations are an important part of new construction and renovation; while this will be less important for private institutions, working with your state hazard mitigation officials ensures that you are informed of funding available for mitigation. In addition, state officials are responsible for implementing the pre-disaster mitigation funding elements of the DMA 2000. States are the conduit through which most FEMA funds flow, including mitigation program funding, and they set the priorities for allocating those funds.

Experience

Government affairs officials at your institution represent an important conduit in your efforts to stay apprised of Federal legislation and rule changes that could affect your efforts. They should be informed regularly of your mitigation priorities and invited to explore strategies for possible support.

Federal Government. A close relationship with mitigation officials in your FEMA Regional Office will keep you informed of the availability of and steps to apply for Federal hazard mitigation funding. You should also involve your campus' government affairs unit so that your institution can fully take advantage of mitigation funding opportunities created by Federal legislation and rule changes. A list of FEMA Regional Offices appears in Appendix C.

Private Organizations. Your search for mitigation funding should include a survey of local, regional, and national organizations in the private sector that may provide support for your mitigation priorities. The private sector stakeholders involved in your planning process may support or be aware of others that would support some of your disaster mitigation priorities. To the extent that mitigation on your campus minimizes your interruption from a disaster, and thus the impact of a disaster on the community at large, private organizations may be willing to provide some funding to implement portions of your plan.

Private foundations of all sizes represent a potential source of mitigation funding. Your office of sponsored programs or research administration can assist you in searching for foundation opportunities that might support mitigation. Foundations with a direct connection to the university or college are especially important. Many institutions have "friends of the university/college" foundations that provide support for all types of activities on campus. These foundations are excellent resources in your efforts to identify funding sources for disaster mitigation.

MONITORING AND EVALUATION

Being disaster-resistant does not end with the completion of the plan and formal adoption. Indeed, the final step in implementing the plan is to establish a process for regularly monitoring and evaluating your progress.

Plan Review and Modification

At least once annually, but perhaps even more frequently, the entire hazard mitigation plan should undergo a thorough review. Mitigation actions may have been completed, or the vulnerability of your institution to a particular hazard may have changed. Changes in organizational structure may necessitate different implementation strategies. A disaster that presents new challenges to your institution and community may have occurred. Furthermore, new stakeholders may have been identified. Regular updates to the plan will ensure that it is timely and that the data are current. Doing an abbreviated version of the risk assessment and updating the plan and implementation strategies accordingly may be sufficient for a comprehensive review of the plan.

The plan may require a new round of endorsements if it has changed substantially. A simple notice to the stakeholders of the whereabouts of the new plan and changes from the previous document may suffice if the changes are minimal. However, even if there have only been minor changes, senior administrators should be made aware of the review and apprised of the changes. Plan review and modification is also an opportunity to publicize the successes of mitigation actions taken and to reaffirm the continuing commitment to disaster mitigation.

Maintaining the Momentum

Key to implementing the plan is maintaining momentum. One of the greatest long-term challenges to disaster resistance is waning interest in hazard mitigation. Disasters fade into the past, and committed university and community leaders or supporters can change their priorities, their minds, or their jobs. Other, weightier problems may arise, and attention to them will take human and financial resources away from disaster resistance. It is imperative that you establish and cultivate relationships with campus leadership and acquire permanent authority to manage disaster resistance efforts.

One of the most effective ways to maintain momentum is to publicize successes. You may wish to designate a person or group to develop a publicity plan for your efforts; this campaign should include ways to keep the university's disaster resistance efforts visible to the campus community and the nearby jurisdictions.

Experience

Capitalize on what disaster researchers often call the "teachable moment" or "window of opportunity" that emerges in the post-disaster environment. Your efforts to publicize your plan and mitigate future damage must be sensitive to the recovery effort, but it does not have to be postponed until recovery is complete. In fact, the recovery phase is often when it is easiest to retrofit the built environment and affect attitudes about disaster mitigation. Publicizing your plan and efforts at disaster resistance is both appropriate and necessary if implementation of your goals and priorities is to be achieved.

A reality of university life is that problems change, people change in response to associated pressures, organization charts change, and people take other positions and move away. These all operate to diminish your efforts. However, if the development of your mitigation plan has been collaborative and the process has engaged diverse stakeholders, your chances of success are good. The larger the planning group and the more inclusive the process, the more likely your hazard mitigation program is to retain its momentum and continue to reduce losses of life, property, and function from disasters long into the future.

CONCLUSION

The first plan that your college or university adopts establishes a baseline from which to measure progress. As you implement and evaluate actions, your knowledge of hazards and how to best reduce your vulnerabilities increases tremendously. In order to effectively monitor your progress, it is important to take advantage of the worksheets provided here and in the mitigation planning how-to series.

Over time, new partners will become involved in the planning process, providing additional reservoirs of experience and support. Since the political and social arenas, as well as the natural environment, are continually changing, you must periodically revisit and update your plan. As your plan evolves over time, you should see a corresponding improvement in your campus's resilience to the damaging effects of disasters.

APPENDIX A – WORKSHEETS

Worksheet #1: **Build the Planning Team**

Worksheet #2: **Hazard Identification and Risk Assessment**

Worksheet #3: **Identify the Hazards**

Worksheet #4: **Profile Hazard Events**

Worksheet #5: **Inventory Assets**

Worksheet #6: **Assess Priority Assets**

Worksheet #7: **Estimate Losses**

Worksheet #8: **Identify Mitigation Actions**

In establishing a planning team, you want to ensure that you have a broad range of backgrounds, responsibilities, and experiences represented. Below are some suggestions for institution organizations and departments to include in a planning team.

Use the checklist as a starting point for forming your team. Check the boxes beside any individuals or organizations that you have both on and off campus that you believe should be included on your planning team so you can follow up with them.

College/University Administration

- ☐ Chancellor/President
- ☐ Vice Chancellor (VC)/Vice President (VP) Planning and Facilities
- ☐ VC/VP Budget and Finance
- ☐ VC/VP Business
- ☐ Planning Entities
- ☐ Safety Units (Police, Fire, Environmental Health and Safety, Risk Management)
- ☐ Telecommunications/Electronic Communications
- ☐ Human Resources
- ☐ Development Office
- ☐ _____
- ☐ _____
- ☐ _____

Academic Departments

- ☐ Academic Senate Representatives
- ☐ Architecture/Planning
- ☐ Engineering/GIS
- ☐ Earth Sciences/Geology/Geography/Hydrology (depending on the major hazards)
- ☐ Sociology
- ☐ Public Administration

Student Representatives

- ☐ Student Council Representatives
- ☐ Student Life/Residence Life
- ☐ Students from relevant academic departments (vis-à-vis potential thesis topics)

Community/Off-Campus Representatives

- ☐ Local Emergency Manager
- ☐ Emergency Services (Fire/Police)
- ☐ Local Emergency Planning Committee Representative
- ☐ Local Community Planner

☐ Local Economic Development Officer

State Representatives

☐ State Hazard Mitigation Officer

☐ State University Liaison

☐ State Emergency Manager

Local Utilities

☐ Electric Utility

☐ Gas Utility

☐ Water Authority/Sewage Authority

☐ Telephone Companies/Telecommunications

☐ Internet/Fiber Optic System

☐ Transit Authority

Vulnerability Questionnaire

1. What are the hazards in your locale?

2. Do you know the frequency and magnitude of possible future hazard events?

3. Has the university/college ever been affected by any hazard events? If so, how?

4. Are some parts of the campus particularly vulnerable to damages, or is the entire area vulnerable?

5. Are some buildings particularly vulnerable to damages? If so, how?

6. What are the uses and occupancies of the vulnerable buildings?

7. What will the expected damages do—threaten life safety? Ruin buildings? Destroy equipment and computers? Disrupt work?

8. Are your utilities vulnerable to damages? How?

9. What systems depend on either building functionality or utility functionality?

10. What could it cost to repair damages?

11. How long could it take?

12. How will teaching be affected?

13. How will research be affected?

14. How will students be affected on campus?

15. How will students be affected off campus?

16. Will employees who live in the area be able to get to work?

17. Will employees' homes be affected by the hazard event(s)?

18. Could the university be closed down for a significant period of time because of possible disaster losses?

Date: *What kinds of natural hazards can affect you?*

1. List the hazards that may occur on campus.

a. Research newspapers and other historical records. (Check campus archives in library.)
b. Review existing university and community plans and reports.
c. Talk to the experts on campus and in your community, state, or region.
d. Gather information on Internet Web sites.

In the hazard list below, put a check mark in the boxes on the left (Column I) beside all hazards that may occur on your campus.

2. Focus on the most prevalent hazards in your community or state, and your campus.

a. Go to hazard Web sites.
b. Locate your campus on the Web site map.
c. Determine whether you are in a high-risk area. Get more localized information if necessary.
d. In the hazard list below, put a check mark in the boxes on the right (Column II) beside all hazards that pose a significant threat to your community and/or campus.

Use this space to record information you find for each of the hazards you will be researching. Attach additional pages as necessary.

	I	II
Avalanche	☐	☐
Coastal Erosion	☐	☐
Coastal Storm	☐	☐
Dam Failure	☐	☐
Drought	☐	☐
Earthquake	☐	☐
Expansive Soils	☐	☐
Extreme Heat	☐	☐
Flood	☐	☐
Hailstorm	☐	☐
Hurricane	☐	☐
Land Subsidence	☐	☐
Landslide	☐	☐
Severe Winter Storm	☐	☐
Tornado	☐	☐
Tsunami	☐	☐
Volcano	☐	☐
Wildfire	☐	☐
Windstorm	☐	☐
Other_____	☐	☐
Other_____	☐	☐
Other_____	☐	☐

Hazard or Event Description (Type of hazard, date of event, number of injuries, cost and types of damage, etc.)	**Source of Information**	**Map Available for This Hazard?**	**Scale of Map**

Date:

Note: Use FEMA 386-2 for assistance in completing this Worksheet.

Obtain or create a base map.

You can use existing maps from:	*OR you can create a base map using:*	Title of Map	Scale	Date
▪ *Campus facilities department* ▪ *Campus GIS maps* ▪ *USGS topographic maps or Digital Orthophoto Quarter Quads (DOQQ)* ▪ *Maps from your city and county* ▪ *Topographic and/or planimetric maps from other agencies* ▪ *Aerial topographic and/or planimetric maps*	▪ *Field surveys* ▪ *GIS software* ▪ *CADD software* ▪ *Digitized paper maps*			

	Obtain Hazard Profile Information	Record Hazard Profile Information
Flood	☐ 1. Meet with your local floodplain administrator to review the Flood Insurance Study and mapping information.	☐ 1. Transfer the boundaries from your Flood Insurance Rate Map onto your base map (floodway, 100-yr flood, 500-yr flood). ☐ 2. Transfer the Base Flood Elevations onto your base map.
Earth-quake	☐ 1. Seek out specialists either on campus or in local or state emergency management offices to determine risk ☐ 2. Review state geological survey maps ☐ 3. Go to the website: http://geohazards.cr.usgs.gov	☐ 1. Record the probability, epicenter location(s), and shaking intensity of potential earthquakes.
Tsunami	☐ 1. Get a copy of your tsunami inundation zone map from your local or state Emergency Manager.	☐ 1. Copy the boundary of your tsunami inundation zone onto your base map.
Tornado	☐ 1. Find your design wind speed.	☐ 1. Record your design wind speed: _____ ☐ 2. If you have more than one design wind speed, print, download, or copy your design wind speed zones, copy the boundaries of your design wind speed zones onto your base map, then record the design wind speed zones on your base map.
Coastal Storm	☐ 1. Get a copy of your FIRM. ☐ 2. Verify that the FIRM is up to date and complete. ☐ 3. Determine the annual rate of coastal erosion. ☐ 4. Find your design wind speed.	☐ 1. Transfer the boundaries of your coastal storm hazard areas onto your base map. ☐ 2. Transfer the BFEs onto your base map. ☐ 3. Record the erosion rates on your base map: _____ ☐ 4. Record the design wind speed here and on your base map: _____
Land-slide	☐ 1. Map location of previous landslides. ☐ 2. Map the topography. ☐ 3. Map the geology. ☐ 4. Identify the high-hazard areas on your map.	☐ 1. Mark the areas susceptible to landslides on your base map.
Wildfire	☐ 1. Map the fuel models located within the urban/wildland interface areas. ☐ 2. Map the topography. ☐ 3. Determine your critical fire weather frequency. ☐ 4. Determine your fire hazard severity.	☐ 1. Draw the boundaries of your wildfire hazard areas onto your base map.
Other	☐ 1. Map the hazard.	☐ 1. Record hazard event info on your base map.

Date: *What will be affected by the hazard event?*

Determine the proportion of buildings, the value of buildings, and the population on campus that are located in hazard areas.

Hazard _____

Type of Building	Number of Structures			Value of Structures			Number of People		
	# on Campus	# in Hazard Area	% in Hazard Area	$ on Campus	$ in Hazard Area	% in Hazard Area	# on Campus	# in Hazard Area	% in Hazard Area
Residential									
Classroom Buildings									
Administration									
Research									
Recreational Use									
Libraries									
Medical Facilities									
Dining Facilities/Auditoria									
Utilities									

	Y	N
1. Do you know where the greatest damages may occur in your hazard areas?	_____	_____
2. Do you know whether your critical facilities will be operational after a hazard event?	_____	_____
3. Is there enough data to determine which assets are subject to the greatest potential damages?	_____	_____
4. Is there enough data to determine whether significant elements of the campus are vulnerable to potential hazards?	_____	_____
5. Is there enough data to determine whether certain areas of historic, environmental, political, or cultural significance are vulnerable to potential hazards?	_____	_____
6. Is there concern about a particular hazard because of its severity, repetitiveness, or likelihood of occurrence?	_____	_____
7. Is additional data needed to justify the expenditure of funds for mitigation initiatives?	_____	_____

Date: *What will be affected by the hazard event?*

Compile a detailed inventory of what can be damaged by a hazard event.

Inventory the assets that are of highest priority to your institution's operations that can be damaged by a hazard event.

Hazard _____

Name or Description of Asset	Sources of Information	Critical Facilities ✓	Emergency Operations ✓	Communications Systems ✓	Data Systems ✓	Laboratories ✓	Size of Building (sq ft)	Replace-ment Value ($)	Contents Value ($)	Function or Use Value ($)	Displace-ment Cost ($ per day)	Occupancy or Capacity (#)	Other Hazard-Specific Information

Date: *How will the hazard events affect you?*

Note: Use FEMA 386-2 for assistance in completing this Worksheet.

Hazard _____

Structure Loss						**Contents Loss**				
Name/Description of Structure	Structure Replacement Value ($)	x	Percent Damage (%)	=	Loss to Structure ($)	Replacement Value of Contents ($)	x	Percent Damage (%)	=	Loss to Contents ($)
		x		=			x		=	
		x		=			x		=	
		x		=			x		=	
		x		=			x		=	
		x		=			x		=	
		x		=			x		=	
		x		=			x		=	
		x		=			x		=	
Total Loss to Structure						**Total Loss to Contents**				

Structure Use and Function Loss									
Name/Description of Structure	Average Daily Operating Budget	x	Functional Downtime (# of days)	+	Displacement Cost per Day ($)	x	Displacement Time ($)	=	Structure Use and Function Loss ($)
		x		+		x		=	
		x		+		x		=	
		x		+		x		=	
		x		+		x		=	
		x		+		x		=	
		x		+		x		=	
		x		+		x		=	
Total Loss to Structure Use & Function									

Structure Loss + Content Loss + Function Loss ($)
Total Loss for Hazard Event

Date:

Instructions: For each type of loss identified on previous worksheets, determine possible actions. Record information below.

Hazard _____

Priority	**Possible Actions** (include location)	**Sources of Information** (include sources you consulted for future reference and documentation)	**Comments** (Note any initial issues you may want to discuss or research further)	**Planning Reference** (Determine into which pre-existing planning systems or activities the suggested projects can be integrated)

APPENDIX B – LIBRARY

Publications:

Federal Emergency Management Agency (FEMA), *Mitigation Resources for Success*, FEMA 372.

FEMA, *Getting Started, Building Support for Mitigation Planning*, FEMA 386-1, FEMA 386-1CD.

FEMA, *Understanding Your Risks, Identifying Hazards and Estimating Losses*, FEMA 386-2, FEMA 386-2CD.

FEMA, *Developing the Mitigation Plan, Identifying Mitigation Actions and Implementation Strategies*, FEMA 386-3, FEMA 386-3CD.

FEMA, *Bringing the Plan to Life, Assuring the Success of the Hazard Mitigation Plan*, FEMA 386-4, FEMA 386-4CD.

National Oceanic and Atmospheric Administration, *Community Vulnerability Assessment Tool*, www.csc.noaa.gov/products.

University of California, Berkeley, *Economic Benefits of a Disaster-resistant University: Earthquake Loss Estimation for UC Berkeley*, www-iurd.ced.berkeley.edu/pub/WP-2000-02.pdf.

University of California, Berkeley, *Seismic Protection of Laboratory Contents*, www-iurd.ced.berkeley.edu/pub/WP-2003-02.pdf.

Note: To order FEMA publications, please call the FEMA Publications Warehouse: 1-800-480-2520

Web Sites:

Federal Emergency Management Agency (FEMA): *www.fema.gov*

FEMA Mitigation Planning: *www.fema.gov/fima/planning.shtm*

Multi-Hazard Mapping Initiative: *www.hazardmaps.gov*

American Association of Community Colleges: *www.aacc.nche.edu*

Campus Safety, Health, and Environmental Management Association: *www.cshema.org*

Institute for Business and Home Safety: *www.ibhs.org*

National Association of College and University Business Officers: *www.nacubo.org*

National Emergency Management Association: *www.nema.org*

National Voluntary Organizations Active in Disaster: *www.nvoad.org*

Society for College and University Planning: *www.scup.org*

State Hazard Mitigation Officers Network: *www.hazmit.net*

University Risk Management & Insurance Association: *www.urmia.org*

APPENDIX C

I. 442 J.W. Mc Cormack POCH
Boston, Massachusetts 02109
(617)223-9540

II. 26 Federal Plaza
New York, New York 10278
(212) 680-3600

III. 615 Chestnut Street
Philadelphia, Pennsylvania 19106
(215) 931-5608

IV. 3003 Chamblee-Tucker Rd.
Atlanta, Georgia 30341
(770) 220-5200

V. 536 South Clark St.
Chicago, IL 60605
(312) 408-5500

VI. Federal Regional Center
800 N. Loop 288
Denton, Texas 76209
(940) 898-5399

VII. 2323 Grand Boulevard
Suite 900
Kansas City, MO 64108
(816) 283-7061

VIII. Building 710, Box 25267
Denver, CO 80225-0267
(303) 235-4800
(303) 235-4976 FAX

IX. 1111 Broadway, Suite 1200
Oakland, CA 94607
(510) 627-7100

X. 130 228th Street, SW
Bothell, WA 98021
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