

Introduction: why disaster management is important . . .how to use this module . . .disaster preparedness and mitigation . . .Introduction to disaster management . . .an overview of disaster preparedness and mitigation . . .Volunteer safety and security . . .The role of the Volunteer in disaster preparedness and mitigation . . .When should these sessions be conducted? . . .review of basic disaster terminology and historical context

# Disaster Preparedness and Mitigation

A Pre-Service Training Module

Peace Corps



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# **Disaster Preparedness and Mitigation (DPM):**

**A Pre-Service Training Module**



**Peace Corps**  
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## Acknowledgments

Hurricanes Georges and Mitch in Central America and the Caribbean in 1998 underlined the importance of disaster preparedness and mitigation and the role that Peace Corps Volunteers can play in encouraging communities to better prepare for and mitigate the impact of the next disaster. In response to these disasters, Peace Corps/Haiti and Peace Corps/Honduras, with assistance from several Crisis Corps Volunteers, took the lead in developing Pre–Service Training and In–Service Training materials for their Volunteers.

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This training program provided the basis for the current design, and was critical in pointing the authors in the right direction.

*Plan Comunal de Emergencia*, Comisión Nacional de Emergencia, Costa Rica.

*Plan Familiar de Emergencia*, 2da edición, Comisión Nacional de Emergencia, Costa Rica, 1994.

*Taller de Instructores del Programa Masivo de Capacitación Sobre Prevención y Manejo de Desastres Nacionales*, Comisión Permanente de Contingencias, (COPECO), Honduras.

*Mitigación de Desastres*, Programa de Entrenamiento para el Manejo de Desastre, PNUD, 1999.

*Community-Based Disaster Preparedness Training Program*, Peace Corps/Haiti, 1999.

The materials development team in Washington included Crisis Corps; Judee Blohm and Ron Savage from the Center for Field Assistance and Applied Research; and Pamela Pine from the Futures Group.

## Acronym List

APCD	Associate Peace Corps Director
CDERA	Caribbean Disaster Emergency Response Agency
CDM	comprehensive disaster management
DPM	disaster preparedness and mitigation
EAP	Emergency Action Plan
FEMA	Federal Emergency Management Agency
IST	In–Service Training
MOH	Ministry of Health
NDMC	National Drought Mitigation Center
NGO	non–governmental organization
PACA	Participatory Analysis for Community Action
PC	Peace Corps
PCV	Peace Corps Volunteer
PST	Pre–Service Training
SADC	South African Development Community
USAID	U.S. Agency for International Development

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# Introduction

## *Why Disaster Management Is Important*

The developing world will continue to be hardest hit by the cascading effects of human–driven climate change, environmental degradation, and population pressures. Fires, droughts, and floods from [the 1998s] El Niño claimed 21,000 lives while the deforestation in China’s Yangtze basin contributed to the flooding which affected the lives of 180 million people. In Russia, the extreme winter weather turned into a disaster when it struck a society where 44 million people are living in poverty, one million children are homeless, and tuberculosis rates are skyrocketing. This insidious combination is throwing millions more into the path of potential disaster. Already, 96 percent [sic] of all deaths from natural disasters occur in developing countries. One billion people are living in the world’s unplanned shantytowns, and 40 of the 50 fastest growing cities are located in earthquake zones. Another 10 million people live under constant threat of floods.

—Federal Emergency Management Agency website ([www.fema.gov](http://www.fema.gov)). International Federation of the Red Cross and Red Crescent. “World Disasters Report Predicts a Decade of Super–Disaster.” Geneva, Switzerland: International Federation of the Red Cross and Red Crescent, June 24, 1999.

Natural disasters kill one million people around the world each decade and leave millions more homeless each year. Economic damages from natural disasters have tripled in the past 30 years—rising from \$40 billion in the 1960s to \$120 billion in the 1980s.

—U.S. Agency for International Development, Office of Foreign Disaster Assistance website ([www.info.usaid.gov/hum\\_response/ofda](http://www.info.usaid.gov/hum_response/ofda)), 2000. United Nations. “Disasters: A Deadly and Costly Toll Around the World.” New York: UN, 1997.

The continuing worsening effects of natural disasters, particularly on the world’s poor, caused the United Nations to designate the 1990s as the “International Decade for Natural Disaster Reduction.” The purpose of this action was to reduce losses caused by such phenomena as earthquakes, volcanic eruptions, landslides, tropical cyclones, floods, and droughts. Although some progress was made during the decade, losses resulting from disasters continue to grow as more people and structures occupy hazardous areas.

The consequences of disasters upon the physical safety of those exposed and upon their material possessions can be tremendous. The massive rainfall accompanying Hurricane Mitch in 1998 resulted in a disaster of gigantic proportions, flooding towns and villages in nearly all of Honduras and destroying homes, bridges, roads, and crops. It is estimated that 10,000 to 15,000 were killed, and 65,000 were left homeless. The communities that were affected had to deal with the homeless, provide medical care, ensure clean food and water, and reestablish basic services. Most communities were caught unprepared, although the ability of even the poorest communities to pull together and solve their most pressing problems was impressive. Disasters in other parts of the world—Hurricane Georges in the Caribbean, the current drought in the Horn of Africa (by mid–2000, 750,000 people in Somalia and 3.3 million in Kenya remained affected by drought conditions [USAID, 2000]), recent floods in Mozambique, and numerous disasters in Bangladesh—have similarly challenged the ability of communities to respond to their needs. As a result, many communities are taking disaster preparedness seriously and have put together emergency plans that specify the resources that are available to face future problems.

Hurricanes Georges and Mitch underlined once again the importance of natural disaster preparedness and mitigation (DPM) and the role that Peace Corps Volunteers can play in encouraging their communities to better prepare for and mitigate the impact of natural disasters. In response to Hurricanes Georges and Mitch, Peace Corps/Haiti and Peace Corps/Honduras, with assistance from several Crisis Corps Volunteers, developed Pre–Service Training (PST) and In–Service Training (IST) modules for their Volunteers. This module draws on their work. Special recognition for the PST goes to Ellen Izaguirre, former training director for the Peace Corps.

Peace Corps country staff are strongly encouraged to adapt the training design to the specific post conditions and the needs of the Volunteers and to look for opportunities to promote the topic as important and relevant to the communities where Volunteers serve, as well as for the Volunteers' personal safety.

### *Purpose, Goals, and Objectives of the Pre–Service Training*

Volunteers live and work in communities that may be especially affected by natural disasters because they are often in developing countries. They can and do make an enormous difference to the people within these communities. The purpose of this Pre–Service Training (PST) is to provide an introduction to and an overview of disaster management to minimize the risk of loss of life, negative economic impacts, and other potential effects of disasters.

This training aims to help provide Volunteers with information that they can use during their service to help protect themselves and others. These materials are intended not only for those whose jobs focus on environmental work but also for health workers, agricultural extensionists, teachers, and others who might benefit in natural disaster–prone communities. PST activities such as this one focus on basic information, knowledge building, and safety. The IST module provides more indepth information on how Volunteers may be useful before and after a natural disaster occurs.

The goals of the Pre–Service Training are to increase Volunteers' ability to:

1. Maintain their own safety and security during emergency and natural disaster situations; and
2. Help communities to develop preliminary preparedness plans, institute mitigation measures, and increase their capacity to cope with disaster situations.

The objectives of Part One of the PST are to:

1. Strengthen the ability of Volunteers to maintain their own safety and security during emergency and disaster situations; and
2. Identify the elements of the disaster cycle and key actions to take at its various phases.

The objectives of Part Two of the PST are to:

1. Increase Volunteers' understanding of their individual communities' historical settings and conditions with regard to specific types of hazards/disasters;
2. Increase Volunteers' understanding of what their communities need to do to prepare for a disaster (based on a community risk analysis); and
3. Increase Volunteers' ability to conduct a community risk analysis.

## *Who Is This Module For?*

This module is presented in such a way that Peace Corps trainers with general or technical backgrounds (whether they work in the environment, agriculture, education, or community development fields) can be trained to conduct this workshop and present the information. Some trainers will use all or most of these exercises, and others will use only selected parts. In either case, trainers will probably wish to supplement sessions from the module with additional information and/or sessions of their own. The materials can be used with any Trainee group (the primary audience) that Peace Corps staff believe it is important to reach with this information. This is true whether the Trainee group has a technical or generalist background.

## *How To Use This Module*

Trainers can use this module in different ways, depending on a variety of factors, including:

- The background of the Trainees;
- The particular jobs Trainees are being prepared for; and
- The trainer’s own background and experience.

Depending upon these variables, the trainer may choose to include all sessions in the module in the technical training component of the PST or may use selected parts of the module and combine it with additional materials. Experienced trainers may prefer to use some of their own training materials to cover certain topics and then add topics that are not addressed.

Trainers may be able to use some exercises as they are designed, with little or no adaptation. For others, they may want to cover the topics addressed, but you may want to make changes to the exercises. The goal is to address as many of the key topics as are relevant to the Volunteers’ situations. The specific needs of every PST cannot be met in a generic module.

## *How Is the PST Module Organized?*

This module consists of four sections:

1. The Trainer’s Guide.
2. Part One: Disaster Preparedness and Mitigation.
3. Part Two: The Role of the Volunteer in Disaster Preparedness and Mitigation.
4. The Appendices: Background and Reference Material.

In general, this module is intended to offer a balance between the technical and practical aspects of disaster management. Part One provides an overview of basic information, such as terminology, historical events, theoretical information, and relevant background. Part Two provides the Trainees with skills training and a chance to practice newly acquired skills in the classroom and in the field. The materials are organized so that earlier sessions prepare participants for subsequent ones. Each part of the module builds on previous components.

## *Content of the Module: An Overview*

The Trainer’s Guide contains an overview of the module, including purpose, design, and audience. It provides a brief synopsis of each section’s content and notes on delivering the sessions.

### **Part One: Disaster Conditions—Disaster Preparedness and Mitigation**

Part One provides an overview of natural disasters and disaster management. The sessions in Part One provide Trainees with fundamental information about natural disasters and how to respond to them and allow Trainees to call on information familiar to them to better understand the conditions in their host country. The exercises in Part One assist Trainees to identify what is important to ensure their own safety, minimize human impacts, and respond appropriately should a natural disaster occur. The trainer should feel free to supplement the information in the training module by speakers and audiovisual presentations.

### **Part Two: The Role of the Volunteer in Disaster Preparedness and Mitigation**

This section contains important hazard and disaster information that will probably be new to most generalists. If you have a group of specialists with disaster management expertise, you may be able to skip some sessions in this part. However, if the specialists have not encountered certain natural disasters or conditions similar to those prevalent in the host country, most of the analysis and mapping exercises—key technical foci—will still be relevant.

Before Trainees begin to work in a disaster management program, they first need to understand the setting or context in which they will be working. The section provides a review of the related terminology and builds on the knowledge gained by Trainees thus far. The Trainees begin the important work of gathering general information about the community, its past and possible future hazards, and approaches to disaster management. They then will need additional exposure to ideas and methods that are introduced in the IST.

### **Notes on Delivering These Sessions**

The most important suggestion for trainers is to read each session or exercise, including the trainer notes and Trainee handouts, well in advance. Advance reading will help trainers to determine what information is relevant. It also will help you decide if you need to make changes or if you can deliver the exercise as it is written.

Some or all sessions may need to be amended to suit the specific needs of a particular PST. Changes should be made as part of preparation. These changes might need to be made in response to:

- Prior background and skill level of the training group;
- The kind of work Volunteers will be doing;
- The amount of training time available;
- The availability of other sessions that have covered similar topics;

- Circumstances in the Trainees’ community/country, including a history of natural disasters; and
- Nature and availability of training staff and other resources.

Each session includes the following components:

<b>OVERVIEW</b>	A description of the key content of the session and its importance. Include some or all this information in the overview and objectives in the introduction of the session in Step 1 of your delivery.
<b>OBJECTIVES</b>	Two or three brief statements describing what Trainees will accomplish as a result of the session.
<b>TIME</b>	The times given are approximate. Trainers should read through the steps and estimate how long each will take, given their particular circumstances.
<b>STAFF</b>	This heading only appears if resource people, such as Ministry of Health (MOH) or other country officials, current Volunteers or staff, or additional training personnel are needed to conduct the session.
<b>MATERIALS</b>	Materials necessary for the sessions are listed here. Handouts listed in this section are found at the end of the session unless they are to be prepared by the trainer.
<b>PREPARATION</b>	This section is included only if any special preparation is required to conduct the session.
<b>DELIVERY</b>	<p><b>Step 1</b> in all these sessions is an explanation of what the activity consists of and why the particular knowledge or skill is needed by Trainees. The session should be related to earlier and later sessions in the training.</p> <p><b>Remaining Steps:</b> Read through the various steps carefully so that you understand the flow of the session. Try to anticipate any problems or questions that may arise at each stage. You may choose to eliminate or add some steps.</p> <p><b>Closing:</b> Close each session with some type of review of the major points.</p>
<b>RESOURCES</b>	If there are particular publications or other materials that might be helpful in preparing the session and/or useful as references during the session, they are listed here.

## Schedule of Activities

Sessions	Estimated Time	Exercises From the Manual
<b>Part One: Disaster Preparedness and Mitigation</b> <ol style="list-style-type: none"> <li>1. Overview of Disaster Management</li> <li>2. Overview of Disaster Preparedness and Mitigation</li> <li>3. Volunteer Safety and Security</li> </ol>	45 min. 1 hr. 45 min. 2 hrs.	Part One, Session 1 Part One, Session 2 Part One, Session 3
<b>Part Two: The Role of the Volunteer in Disaster Preparedness and Mitigation</b> <ol style="list-style-type: none"> <li>1. Review of Basic Disaster Terminology and Historical Events</li> <li>2. Preparation for Community Natural Disaster Vulnerability Analysis and Mapping (plus field research)</li> <li>3. Preparation for Community Field Research (plus field research)</li> </ol>	2 hrs. 30 min. 2 hrs. class time; 3 hrs. field research 2 hrs. class time; 3 hrs. field research	Part Two, Session 1 Part Two, Session 2 Part Two, Session 3

After the completion of these PST sessions, Trainees will have a basic knowledge of natural disaster management issues. They will have information about how to protect themselves and others as well as the preliminary skills they need to identify their communities' vulnerability to natural disasters. Finally, they will be able to begin the process of organizing for disaster preparedness. This preliminary knowledge and skills can be further enhanced through the In–Service Training.

# Part One:

## Disaster Preparedness and Mitigation

### *Introduction*

Part One introduces the principal aspects of disaster preparedness, mitigation, and management in–country. It also examines the various types of responses that can occur.

### *Summary of Sessions*

**Session 1: Introduction to Disaster Management.** This section contains an introduction to disasters and disaster management and then leads Trainees into a clearer understanding of the goals and objectives of the Peace Corps’ disaster management training.

**Session 2: An Overview of Disaster Preparedness and Mitigation.** This section contains information about the anatomy of disasters: the disaster cycle and the actions that need to occur during each phase of the cycle.

**Session 3: Volunteer Safety and Security.** This section focuses on how Volunteers can maintain their safety in the face of possible disasters.

All Trainees interested in disaster management need to understand the differences in approaches to and attitudes toward hazards and/or deleterious impacts. This will help the Trainees plan for and deal with reactions that they might encounter during the development of disaster prevention and mitigation programs. This focus preferably should have already been addressed; if not, some commentary should be made by the trainer or associate Peace Corps director (APCD) at the beginning of the session.

### *When Should These Sessions Be Conducted?*

The determination of when to provide technical training on disaster preparedness and mitigation depends on the country and the likelihood of natural hazards in that country as well as on the makeup of the group of Trainees who are assigned there. In countries in which the likelihood of disaster is high, the subject is more pressing and is more likely to generate high interest. It will be up to the trainer—in collaboration with the country Peace Corps director and/or appropriate APCDs—to determine the timing of this technical training. Because Session 3 pre–supposes some familiarity with the country, this training probably should not occur before the midpoint of PST.

## Session 1: *Introduction to Disaster Management*

### Overview

This session provides a general introduction to natural disasters and provides more specific information about them. It discusses hazards that are most likely to strike the country and the specific local vulnerabilities. (The terms “hazards” and “country” are identified in each post’s Emergency Action Plan [EAP], which also provides instructions for Volunteers in the event of a disaster or emergency). It reviews country–specific problems or issues that may arise as Volunteers try to deal with disaster management. It provides the basis for the rest of the disaster management training by introducing the important role that individuals can play in disaster preparedness and mitigation.

### Objectives

By the end of the session, the Trainees will be able to:

1. Identify some of the hazards that may present themselves during a disaster in the Trainees’ host country.
2. Identify the rationale for and goals of this Peace Corps training and what Trainees can expect to get out of it.

### Time

45 minutes

### Materials

Prepared Flip Charts

- Goals of Peace Corps Disaster Training
- The Role of the Volunteer in Disaster Mitigation: Part One Primary Objectives

Handouts

- *Pre–Test*
- *True/False Questionnaire*

Other materials to distribute, as necessary

- Volunteer Handbook
- Emergency Action Plan (EAP)

Audiovisual materials/equipment as needed

Blank flip charts and marking pens

### Staff

The appropriate APCD or a special speaker should participate at the beginning of the session to emphasize the importance of the topic due to the country’s potential hazards and vulnerabilities. The speaker should be selected based on his or her experience or familiarity with both natural hazards and vulnerabilities to disaster in–country. This speaker also can make the connection

between the country’s need and the Peace Corps’ involvement. Such an introduction will be especially important in countries in which no major natural disaster has happened in recent memory.

## Preparation

The trainer should meet with the APCD (or speaker) in advance to review the goals and objectives of the session and to provide an overview of the training program. The trainer should inform the speaker about the general backgrounds and educational levels of the Trainees, provide the speaker with suggestions on information that should be discussed with the Volunteers, and inform the speaker about the types of questions Volunteers may ask. The trainer should also ensure that the speaker includes visual aids that can accompany the descriptive information that will be provided about the types of hazards that occur in the host country. The trainer should find out if the speaker is considering the use of any electronic audiovisual equipment and make necessary arrangements for the equipment and its use. (If needed resources cannot be guaranteed, the trainer should inform the speaker and request that other kinds of visuals be used instead). Finally, the trainer should discuss with the presenter the amount of time needed/available for the presentation (approximately 10 to 15 minutes).

As part of the introduction to this session, the trainer and/or guest speaker may wish to engage the Trainees in completing a true/false questionnaire concerning the general state of disasters in the world. The trainer and/or speaker can change or add statements to the questionnaire to make it more appropriate to the level of the Trainee.

## Delivery

### Step 1.

- a. Briefly describe the focus of the session, the training atmosphere (i.e., informal, interactive) and generally, the types of activities they can expect to be included during the training. Invite any initial questions.
- b. Explain the *Pre–Test* by noting that it is not really a test but is designed to help Trainees identify what they know and do not know and recognize what they have learned as a result of the training. Let them know that the *Pre–Test* includes a number on the upper right corner only and that no names need be added. When collected, the *Pre–Tests* will be used for training evaluation and improvement purposes and then will be made available to the Trainees. Tell the Trainees to write down their numbers and keep them so that afterward they will know which *Pre–Test* is theirs.

### Step 2.

Distribute and have Trainees complete the *Pre–Test*. They have 10 minutes to fill out the forms.

### Step 3.

Introduce the APCD or guest speaker and explain his or her particular knowledge of the topic.

(Optional) Provide the context for guest speaker’s discussion of hazards in the host country, by highlighting the general state of disasters in the world. Distribute the handout *True/False Questionnaire on the General State of Disasters in the World* and have Trainees complete it. The guest speaker should reveal the following answers to the questions as part of the presentation: question 1 = false; questions 2 to 6 = true. More complete answers to questions 1 to 3 can be found in Heiberg (from the FEMA website, 1999); more complete answers to questions 4 to 6 can be found in United Nations (from the USAID/OFDA website, 1997). Both complete references can be found on page 15 under the Resources section of this session.

**Step 4.**

The speaker should identify the various types of hazards that occur and the types that are most prevalent in the country, using visual aids if possible. Afterward, the speaker might canvas the Trainees and ask each participant to give one word that expresses their reaction to what they just viewed. The speaker should write these words on a flip chart.

**Step 5.**

The speaker talks about vulnerabilities: economic, physical, and social.

**Step 6.**

- a. After the presentation, the speaker should emphasize that the results of natural hazards do not have to be disastrous. The talk should conclude with the rationale behind Peace Corps’ disaster preparedness and mitigation training: to provide the Trainees with the knowledge and skills they need to design and implement strategies that will lessen the devastating effects of natural hazards by decreasing vulnerabilities.
- b. When the speaker is finished, thank him or her.

**Step 7.**

Show and discuss the flip chart below.

<p><b><i>Goals of Peace Corps Disaster Training</i></b></p> <ol style="list-style-type: none"><li>1. To reduce the vulnerability of Volunteers and their host communities in the face of disasters</li><li>2. To lessen the magnitude of the impact of disasters at the community level</li><li>3. To encourage resiliency and rapid “bounce–back” after disasters so as to continue positive development efforts</li></ol>
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Then, show and discuss the following flip chart.

***The Role of the Volunteer in Disaster Mitigation: Part One Objectives***

1. To strengthen the ability of Volunteers to maintain their own safety and security during emergency and disaster situations
2. To identify the elements of the disaster cycle and key actions to take at its various phases

## Closing

Ask several Trainees to summarize this first session.

## Resources

Federal Emergency Management Agency website ([www.fema.gov](http://www.fema.gov)). International Federation of the Red Cross and Red Crescent. “World Disasters Report Predicts a Decade of Super-Disaster.” Geneva, Switzerland: International Federation of the Red Cross and Red Crescent, June 24, 1999.

U.S. Agency for International Development, Office of Foreign Disaster Assistance website ([www.info.usaid.gov/hum\\_response/ofda](http://www.info.usaid.gov/hum_response/ofda)), 2000. United Nations. “Disasters: A Deadly and Costly Toll Around the World.” New York: UN, 1997.

*Types of Hazards/Disasters: Effects, Lessons Learned, and Appropriate Actions* (Appendix 1).



*Trainee Handout*  
*Pre-Test*

**Participant # \_\_\_\_\_**

1. How do you think Peace Corps Volunteers can help communities better prepare for and minimize the impact of (a hurricane, earthquake, drought, etc. Choice/s should be country-dependent)?
  
2. Define the following terms:
  - a. Hazard –
  - b. Disaster –
  - c. Emergency –
  - d. Vulnerability –
  
3. Typically, there are actions that one can take BEFORE, DURING, and AFTER a natural disaster. Please identify some activities in each category:  
  
Before:    a)  
              b)  
  
During:    a)  
              b)  
  
After:      a)  
              b)
  
4. What is a community risk analysis?
  
5. Identify some activities that might be included in a community risk analysis in \_\_\_\_\_ (name of country).

*Trainee Handout*

*True/False Questionnaire on the  
General State of Disasters in the World*

1. The entire world is hit just about equally in terms of the damage caused by natural disasters. T/F
  
2. Fires, droughts, and floods from the 1998 El Niño claimed more than 20,000 lives. T/F
  
3. Forty to 50 of the fastest growing cities worldwide are located in earthquake zones. T/F
  
4. Natural disasters kill more than 1 million people around the world each decade. T/F
  
5. Economic damages from natural disasters cost more than \$100 billion in the 1990s. T/F
  
6. In many places in the world, long–term suffering from disease and hunger has increased as a result of individual disasters. T/F

## Session 2:

# *An Overview of Disaster Preparedness and Mitigation*

## Overview

This session gives an overview of disaster preparedness and mitigation issues on a national level. It provides a base from which the Trainees can build their knowledge about natural disasters in general and about the conditions in and responses needed in their host country. It identifies and describes country–specific problems or issues regarding disaster management and the tools that exist to address the problems.

## Objectives

By the end of the session the Trainees will be able to:

1. Give the accepted definitions of disaster–related vocabulary.
2. Identify the elements of the disaster cycle and key actions to take during its various phases.

## Time

1 hour and 45 minutes

## Materials

Prepared Flip Charts

- Local Terms Pertaining to Disaster Management (one term per page)
- Definition of Hazard
- Definition of Disaster
- Definition of Vulnerability
- Definition of Risk
- Definition of Emergency
- Diagram of the Disaster Cycle

Handouts

- *News Release on Disaster Response in the United States*
- *The Disaster Cycle*
- *Types of Hazards/Disasters: Effects, Lessons Learned, and Appropriate Actions* (applicable selections from Appendix 1)
- *The Full Range of Effects of Drought* (Appendix 2)

Blank flip charts, marking pens, and masking tape

## Preparation

Check with Trainees prior to the session to identify those who have experienced natural hazards and/or disasters and who would be willing to share their stories and insights.

On flip charts, write words on separate flip chart pages that are used in the local language and that pertain to disaster management, such as “hazard” and “disaster.” Place the English translation in parentheses next to each word.

For each disaster–related term below, prepare a flip chart page with its definition. Consider the sample probes below in planning ways to stimulate discussion among Trainees about the terms.

### ***Word Probes and Definitions***

#### **HAZARD**

##### **PROBES**

- What hazards are we most likely to encounter in our host country?
- Did you face any of these hazards where you lived in the United States?
- Do all hazards cause human disasters? Why or why not?
- Can natural hazards or disasters be prevented? (*Not with our current knowledge—perhaps in the future*)

*(The key is that the event takes place in an area of human settlement.)*

**DEFINITION:** A natural phenomenon or event that may cause physical damage or economic loss or may threaten human life and well–being if it occurs in an area of human settlement. A hazard can cause catastrophic events in places where there is no human settlement, such as when a forest fire destroys a national park.

#### **DISASTER**

##### **PROBES**

- How should a disaster be defined, that is, how is it different from a hazard? (*Human consequences*)
- In the face of a lack of preventive methods, what can be done? (*Ensure long–term planning.*)
- What can be gained with long–term planning? (*Reduction of loss of life, livelihood, and property*)

**DEFINITION:** A serious disruption causing loss of life and property that exceeds the ability of the affected society to cope using its own resources. This is a catastrophic situation where normal life is severely affected.

#### **VULNERABILITY**

##### **PROBES**

- What physical conditions place people at greater/lesser risk? (*roads, buildings*)
- What medical conditions? (*disability, mobility, blindness*)
- What social or cultural conditions? (*elderly, monolingual households, women versus men, children*)
- What economic conditions? (*insurance, etc.*)

*Continued*

**DEFINITION:** Susceptibility to the negative consequences resulting from a natural disaster. The many types of vulnerability include physical or material vulnerability (housing, infrastructure), social/organizational (social inequality, institutional capacity), and motivational/attitudinal (“can–do” attitude versus fatalism).

**RISK**

**DEFINITION:** In disaster management, risk is defined as hazard + vulnerability

**EMERGENCY**

**PROBES**

- If you live in [a relevant geographic area], what is a hazard that you face every year? (*e.g., hurricanes*)
- When is the emergency phase of a (hazard)? (*When it is approaching and touches land*)
- When is a hurricane that touches land in [a relevant geographic area] a disaster? (*When lives and property are lost, when the power goes out, when the water and phone lines are destroyed, etc.*)
- If that hurricane had gone back out to sea before touching land and just wound itself down without causing any damage, would it have been a disaster? (*No*)
- Even though this time the hurricane did not hit land, was there still an emergency? (*An emergency situation existed during the period of time that it was predicted that the hurricane would touch land.*)
- What kinds of activities were going on in [a relevant geographic area] at that time? (*Evacuating people, securing buildings, stockpiling food, etc.*)

**DEFINITION:** The phase of the disaster during which lives and/or livelihoods are at risk and if action is not taken, lives will be lost.

Create an enlarged drawing of the disaster cycle diagram on a flip chart page. Make sure there is enough space for you to make notes on the flip chart based on Trainee discussions.

Review the resource information on the types of disasters (Appendices 1 and 2). Select those disasters that are applicable to the host country and copy the information as a handout. (Additional information is in the EAP).

**Delivery** 

**Step 1.**

- a. Explain that the training will now address the specific issues of natural disasters and disaster management in the country.
- b. Ask one or more Trainees who have experienced a disaster to share their experiences and/or provide examples of what happened in a Peace Corps host country.
- c. Distribute information about the types of disasters that apply in the host country and allow Trainees a few minutes to review the material.

**Step 2.**

Reveal the flip charts of vocabulary words. Discuss the definitions by asking Trainees, first, what comes to mind with each word. For example, “What comes to mind when the word, ‘Hazard’ is used?” Write the responses on the flip chart and tape it up on a wall.

**Step 3.**

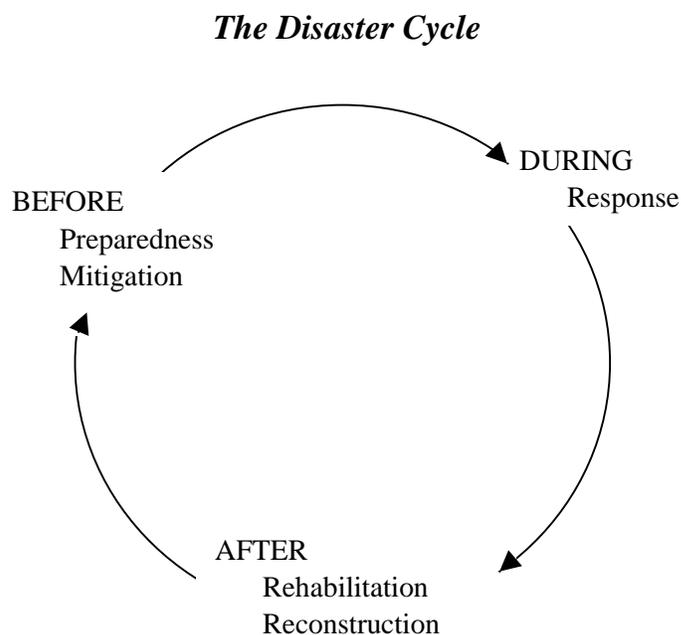
Probe the Trainees’ understanding of each term and then reveal the flip charts with the prepared definitions. If there are aspects of the definitions that were not discussed before, clarify them now.

**Step 4.**

Reveal the disaster cycle on the flip chart. Tell Trainees that there is an accepted way of looking at and organizing the kinds of disaster management activities that are part of addressing a situation where natural hazards occur.

**Step 5.**

Spend about 15 minutes discussing the disaster cycle. Use the following points as a guide:



- Ask Trainees to imagine a disaster in the United States, such as a hurricane in the Gulf of Mexico or an earthquake in California.
- Help the Trainees identify some of the activities that take place during the BEFORE phase that can be labeled as MITIGATION actions (*for example, zoning regulations, watershed management, and setting and enforcing construction standards*). As responses are given, write them in the BEFORE part of the cycle drawn on the flip chart.

- Then, help the Trainees identify activities surrounding the preparedness warning and alert actions in the BEFORE phase (*for example, mass communication of warnings and advisories, evacuations, stockpiling of food and water, boarding/taping of windows, emergency evacuations*).
- Next ask the Trainees to identify activities that take place in the DURING phase by referring to the activities that take place in [a relevant geographic area] during a disaster (*for example, rescue and evacuation activities, National Guard assistance, medical response, shelter setup.*) Write them on the flip chart.
- Finally, refer to the example again, and ask the Trainees what happens AFTER a disaster to get things back to normal functioning. In the United States, the Federal Emergency Management Agency (FEMA) comes in; insurance adjusters move in; basic services are restored; infrastructure is rebuilt; and buildings are condemned. Write the responses on the flip chart next to the AFTER phase of the cycle.

**Step 6.**

Distribute and have Trainees read *News Release on Disaster Response in the United States*. Ask them to identify the likely differences between what happens in the United States and what happens in their host country.

**Step 7.**

Provide the Trainees with the handout *The Disaster Cycle*. Conduct an imaginary disaster cycle for the host country. Trainees should describe both the activities and what they think those activities would “look and feel like” (*e.g., what preparedness activities would make sense in the country*).

**Step 8.**

Finally, ask Trainees if they have any questions.



## *Trainee Handout*

# *News Release on Disaster Response in the United States*

This news release is from FEMA Region X, serving Alaska, Idaho, Oregon, and Washington. It was posted on the FEMA Web site ([www.fema.gov](http://www.fema.gov)) on July 29, 1998.

### **Oregon Targets “Disaster Cycle” Project Impact Up and Running**

Salem, July 29, 1998—Barely 30 days after being invited to join FEMA’s newest initiative to reduce the toll in life and property exacted by some of the worst catastrophic disasters of this decade, the State of Oregon is pulling out the stops—extending their own invitations to citizens, business communities, and Government agencies. The new initiative emphasizes forging grass–roots partnerships, prioritizing hazards, pooling resources, and taking action, and according to Oregon Emergency Management Director Myra Lee, it is the only way to break the painful and costly “disaster–repair–disaster cycle.”

“I’m sure there’s a few armchair quarterbacks out there saying “it’s about time,” and they’re right,” said Lee. “The best solutions are simple solutions—and Project Impact is simplicity itself: identify key stakeholders in building disaster–resistant communities, get them together around a little seed money that they will be able to leverage to extended community support, and set them loose! And that seed money is really more symbolic than anything else. I suspect the real success stories in Oregon will be among our “unfunded” Project Impact communities.”

David L. de Courcy, Regional Director for FEMA Region X, not only agrees, but takes the concept to “the next level.” “It’s not necessarily about speed, and there are no special prizes for the “first community on the block” to become more disaster–resistant... unless of course your community gets hit by a major earthquake or an unseasonable flash flood while still in the planning stages,” said de Courcy. “Myra Lee is right on the mark. Project Impact is all about forging partnerships, prioritizing key hazards, pooling resources, and taking action. It isn’t “just another grant program,” and it isn’t about the money. It’s about effective partnering, responsible planning, innovative resource allocation, and taking action before disaster strikes.”

The two “official” 1998 Project Impact communities in Oregon, Tillamook and Benton Counties, are both at the starting blocks, alerting stakeholders and identifying resources. Benton County’s Emergency Management Council is serving as a core to expand their private/public partnerships, and explore seismic, wildfire, and flood hazards. Tillamook County is likewise focusing on their in–place Performance Partnership Network, promoting community participation through open community forums. Attendees of the upcoming Benton County or Tillamook County Fairs can access Disaster Resistant Community/Project Impact brochures and information sheets at their respective county’s information booth.

## *Trainee Handout*

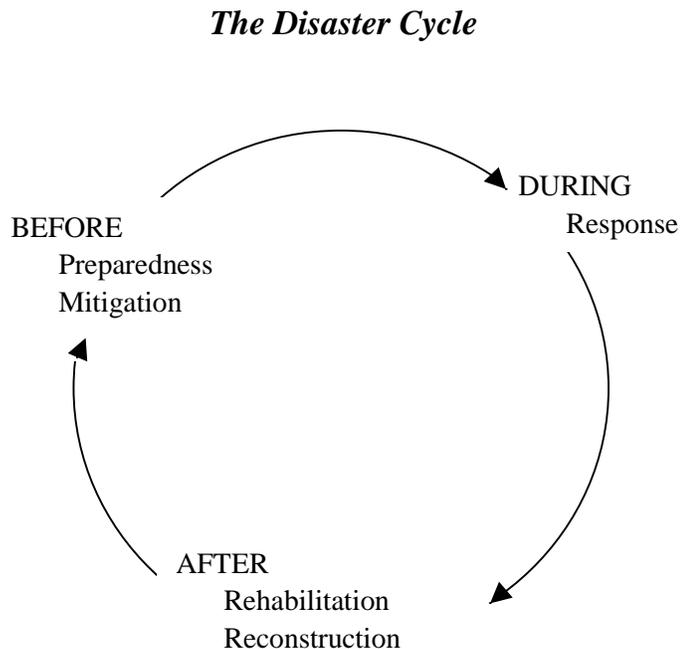
# *The Disaster Cycle*

Disaster experts tell us that the response to disasters can be conceptualized as a cycle with three phases, BEFORE, DURING and AFTER.

The BEFORE phase is that period of time before a disaster hits, including the time when a warning and/or alert is announced, during which preparation and mitigation activities may take place, with the objective of decreasing people's vulnerability and reducing the negative impacts of disasters. Mitigation activities include actions that, in the long term, will lessen the magnitude of effects of hazards. This might include improved housing construction or reforestation of watersheds. Preparation includes such activities as stockpiling food and water or carrying out a simulation at the community level.

The DURING phase is that period of time during which lives and livelihoods are at risk and lasts until the danger is over.

The AFTER phase is the rehabilitation and reconstruction phase, after the immediate danger is past, when people and communities put their lives, livelihoods, and homes back together.



## Session 3:

# Volunteer Safety and Security

### Overview

Safety and security during a natural disaster are the priorities for Volunteers and staff. This session provides Trainees with information about advance planning for their own safety in–country in the event of a disaster. It will help Volunteers identify their responsibilities and the support they will receive from the Peace Corps.

### Objectives

By the end of the session, the Trainees will be able to:

1. Identify the specific hazardous, vulnerable situations in which Volunteers might find themselves and the issues they might have to confront.
2. Identify specific activities that they may be asked to perform in particular hazardous, vulnerable situations.
3. Identify ways to maintain their own safety during emergency and disaster situations.

### Time

2 hours (including a break, if needed)

### Materials

Enough blank flip charts and marking pens for the number of groups created

#### Handouts

- *Disaster scenario* (to be developed by trainer)
- *Group 1 Task: Presentation on BEFORE Phase Activities*
- *Group 2 Task: Presentation on DURING Phase Activities*
- *Group 3 Task: Presentation on AFTER Phase Activities*
- *Group 4 Task: Past In–Country Activities During Emergencies*
- *Group 5 Task: Natural Disaster Preparedness Checklist*
- *Appropriate Roles for Volunteers by Type of Hazard/Disaster* (Handout, Part Two, Session 3)
- Volunteer Handbook
- EAP

### Preparation

Select the appropriate resources to be copied and make them available as references during the session.

Determine the number of small groups (five to seven Trainees per group) and prepare their task handouts (group tasks) and any other materials the Trainees will need. (If there have not been emergencies in the recent past in–country, do not use Task 4.) If Trainees need to be grouped in a particular way, prepare a flip chart with group member names.

Develop a realistic disaster scenario for your country. Provide a timeline of when there was an indication of the impending disaster, potential locations, and when and how news spread to citizens.

Develop notes related to each group task that need to be highlighted before or after the group tasks.

Arrange for staff at the training facility to be available for an interview by one of the groups during the session.

## **Delivery**

### **Step 1.**

Provide an introduction using the Overview, above.

### **Step 2.**

Create groups of five to seven people. Assign a group task to each group and distribute copies of the disaster scenario. Have Trainees refer to their copies of the disaster cycle in completing the group tasks. Tell Trainees that they will have approximately 30 minutes to carry out the described task and prepare a five–minute presentation for the rest of the group. Provide a blank flip chart and marker(s) to each group.

### **Step 3.**

Have each group make its presentation. After each presentation, ask if the other Trainees have anything to add. The points below should be brought out in the presentations or considered afterward during processing. The trainer also can raise additional items as needed or applicable.

#### **Group 1**

- What hazards have affected the site in the past that would affect the location where the Volunteer lives?
- Which areas of the town or the village have been damaged?
- What are alternate “escape routes” and means of transportation available if the road to town is rendered impassable?
- How can the Volunteers communicate with the Peace Corps office if regular communication no longer functions?
- What kind of emergency supplies should a Volunteer always have on hand? (Volunteers should be provided with information in the EAP.)
- Do the Volunteers have/have they submitted their site/house locator map?

#### **Group 2**

- Ensure that important points from the post’s EAP and Volunteer Handbook are raised.
- Communication is a subject of major importance, as is complying with instructions from Peace Corps headquarters.
- Volunteers are responsible for their own safety. Although the Peace Corps will do all it can to help, Volunteers should not wait for the Peace Corps to call them.

### Group 3

- Be sure that guidance in the EAP is brought up.
- Select appropriate roles for Volunteers from the handout in Part Two, Session 3.

### Group 4

- How well were people prepared to respond for themselves, for their families, and for communities?
- What was the immediate response?
- What kinds of damage occurred?
- How did the Peace Corps and Volunteers fare?
- What measures have been taken since the disaster to prepare for or mitigate the effects of future disasters?

### Group 5

- Compare this presentation with the presentation of Group 1.
- Trainer may probe for missing items.
- Stress that the focus of today's session is on Volunteer safety and preparedness.

### Step 4.

Go back to the main objectives written on the flip chart and ask the Trainees if they were met. Ask if there are any follow-up questions. Let the Trainees know that in the next session, they will apply some of the concepts discussed in this session and will explore how they can improve their roles as Volunteers.

### Step 5.

Thank the Trainees for their participation.



## *Trainee Handout*

### *Group 1 Task:*

### *Presentation on BEFORE Phase Activities*

Using the disaster cycle framework and considering potential hazards in the host country, prepare an informal presentation that illustrates the activities a Trainee and new Volunteer should carry out during the BEFORE phase to increase their safety and to reduce their vulnerability in the event of the disaster scenario provided. Consider housing choices, vulnerable areas in the community, routes and means of transportation, food and water, etc.

## *Trainee Handout*

### *Group 2 Task: Presentation on DURING Phase Activities*

Using the disaster cycle and considering potential hazards in the host country, prepare a nonformal education presentation that shows what a Volunteer should do in the DURING phase of the disaster in the scenario provided. Remember this includes the period from the time warnings and advisories begin until the disaster passes. Refer to your Volunteer Handbook and the EAP and remember, **your friends and family in the United States will be frantic!**

## *Trainee Handout*

### *Group 3 Task:*

### *Presentation in AFTER Phase Activities*

Using the disaster cycle and considering potential hazards in the host country, prepare a nonformal education presentation that shows what a Volunteer should do in the AFTER phase of the disaster in the scenario provided. Remember, this includes the period immediately after a disaster, when the requirements are to get life functioning again, as well as later follow-up.

## *Trainee Handout*

### *Group 4 Task:*

### *Past In-Country Activities During Hazards*

Interview staff at the training facility to determine what activities, actions, etc. they took related to the last major natural disaster in the host country. How did Volunteers and Peace Corps staff trainers fare? Organize this information in a way that relates to the disaster cycle and devise a creative way to present it to the group.

## *Trainee Handout*

### *Group 5 Task: Natural Disaster Preparedness Checklist*

Put together a Volunteer Natural Disaster Preparedness Checklist. What activities do you need to consider before a natural disaster hits? What housing, community, transport, and food and water issues are important to address? Include all the actions Volunteers should take prior to a disaster or emergency to maximize their safety. Present your information in an interesting format.

*Trainee Handout*  
*Disaster Scenarios (written by Trainer)*

## **Part Two:**

# **The Role of the Volunteer in Disaster Preparedness and Mitigation**

### *Introduction*

Everyone is aware of the environmental problems of global warming and deforestation on the one hand, and the social problems of increasing poverty and growing shanty towns on the other. But when these two factors collide, you have a new scale of catastrophe ... We have a huge increase in the number of people needing our assistance due to floods and earthquakes. In the last six years, it has risen from less than half a million to more than five and a half million

—Dr. Astrid Heiberg, President of the International Federation of the Red Cross and Red Crescent (RCRC). ([www.fema.gov/nwz99/irc624.htm](http://www.fema.gov/nwz99/irc624.htm).)

The knee–jerk reaction to disaster response is not working. We have to structure and fund our emergency service internationally, the same way we do domestically. We do not wait until a house catches fire, then raise money for the fire department.

—Peter Walker, Federation Director of Disaster Policy, International Federation, RCRC ([www.fema.gov/nwz99/irc624.htm](http://www.fema.gov/nwz99/irc624.htm).)

Training in natural disaster preparedness and mitigation is a priority not only for the Peace Corps, but for people and development organizations throughout the world. No country is exempt from natural disasters, and no Volunteer is guaranteed safety when disaster strikes. Leading development agencies know that their funds can be better invested when disaster mitigation measures are included in all projects they finance.

Governmental entities, as well as small, local nongovernmental organizations (NGOs), particularly those based in countries and communities recently affected by disasters, have come to realize that each country and each community must take the responsibility of being better prepared for future emergency and disaster situations. There is also the growing recognition that implementing mitigation activities will reduce a community’s vulnerability in the face of potential hazards. Community–based disaster preparedness and mitigation training is an important tool for increasing the self–sufficiency and response capacity of the world’s poor, who also comprise the population most vulnerable to suffering the devastating consequences of disasters.

Part Two of this training is designed for use during community– or field–based training to help address the points outlined above. The sessions can be broken down further and integrated into center–based training, as long as a community context is provided for the practical activities.

Each Peace Corps country faces different hazards; each has a different natural disaster and emergency history, different response capabilities, and different plans in place for disaster preparedness and response. Therefore, this portion of the training—which focuses on skills needed to help strengthen the ability of communities to develop comprehensive preparedness plans, institute mitigation measures, and increase their capacity to cope with disaster situations—should be adapted to fit the needs of each post.

The disaster preparedness sessions stimulate ideas that can be integrated into existing training plans. To integrate this training into an often–crowded training agenda, trainers are encouraged to incorporate the activities and objectives into sessions and activities already on the calendar. The successful experience of weaving Women in Development and Gender Analysis into the fabric of Peace Corps training at most posts is an example. The development and distribution of the *Disaster Management Training Modules* is the beginning of an effort to accomplish the same goal with community–based natural disaster preparedness and mitigation training.

## *Summary of Sessions*

**Session 1: Review of Basic Disaster Terminology and Historical Events.** With information on vocabulary and conditions that are relevant to a disaster, this session begins to address what a community needs to do to prepare for the eventuality of a natural disaster.

**Session 2: Preparation for Community Natural Disaster Vulnerability Analysis and Mapping.** This session provides Trainees skills for community vulnerability analysis and how to map out the places and issues that they should come to know about at their posts.

**Session 3: Preparation for Community Field Research.** This session provides hands–on exercises that build on the knowledge and skills gained thus far in the training. It allows Trainees to develop near–complete maps that draw on specific conditions in their environment.

## *When Should These Sessions Be Conducted?*

Part One of the Disaster Management Training dealt with Volunteer safety and general disaster theory and terminology and is more easily applied “as is” to most posts. It can be used as a part of Volunteer safety training. Part Two activities are intended to follow Part One sessions—within a schedule that is complementary to the needs of the overall PST.



## Session 1:

# Review of Basic Disaster Terminology and Historical Events

## Overview

This session is designed to be a part of the language training component, if possible. If language training is not included in PST, this module can be implemented as a core curriculum activity. This session provides a review of vocabulary and an overview of disaster conditions, reactions, and assistance needs.

## Objectives

1. To review basic terminology related to disaster theory presented in PST Part One.
2. To learn and use basic natural disaster terminology in the local language.
3. To investigate the history of destructive events in the host community.

## Time

2 hours and 30 minutes (including a 15 minute break, if necessary)

## Materials

Prepared flip charts

- Disaster cycle diagram
- Disaster cycle simple phase definitions
- Hazard–related vocabulary
- Part One Training Objectives.

Visual aids showing hazards and disasters in the host country.

Handouts

- *Destructive Events Charting Form*
- *Role play scenario* (to be developed by trainer)
- *Common Psychological Responses to Disasters*

Blank flip charts and marking pens

## Preparation

If disaster training materials exist in the host country’s language, it is important to review them in order to teach the appropriate terminology. For example, a hazard also may be called a threat or a danger, but in English, the agreed–upon term in disaster jargon is hazard. In Spanish speaking countries, for example, a hazard may be called “amenaza” or “peligro;” different countries use culturally, technically, and country–appropriate terminology. As needed, the definitions in Session 1 can be reworked to simplify them, depending on the language level of the Trainees.

In addition, trainers should be able to define and discuss the hazards that are most prevalent in the host country and the community in which the training is to be conducted. Language facilitators

should investigate the history of disasters and emergencies in the host community and gather information using the *Destructive Events Charting Form* handout.

Discuss the presentation of the EAP with the APCD. Check to see if they wish to present Steps 6 and 7, or at least be present for the Trainee’s reports and the steps that follow.

Based on realistic possibilities for the host country, develop a scenario for a role play interview that contains details needed to complete the *Destructive Events Charting Form*. Have one language teacher prepared to use the scenario in a role play interview in class. The *Case Studies of Peace Corps Volunteers’ Involvement in Disaster Management* (Appendix 4) may be useful resource information.

## Delivery

### Step 1.

Take about 15 minutes to introduce and review the vocabulary, by presenting any of the following information that is relevant to the host country on flip charts.

#### **Hazard Vocabulary**

**Hazard:** A natural phenomenon or event that may cause physical damage, or economic loss or may threaten human life and well-being if it occurs in an area of human settlement.

Droughts	Mudslides
Earthquakes	Natural–technological hazards (flood–pesticide spills)
Epidemics	Tornadoes
Famines	Tsunamis
Flooding	Typhoons
Hurricanes	Volcanoes
Landslides	Wildfires

**Disaster:** The social effects of a hazard **OR** a serious disruption causing widespread loss of life and property that exceeds the ability of the affected society to cope using its own resources **OR** a catastrophic event during which normal life is totally disrupted.

**Disaster Cycle:** A way to conceptualize disasters as an event with three distinct phases—Before, During, and After.

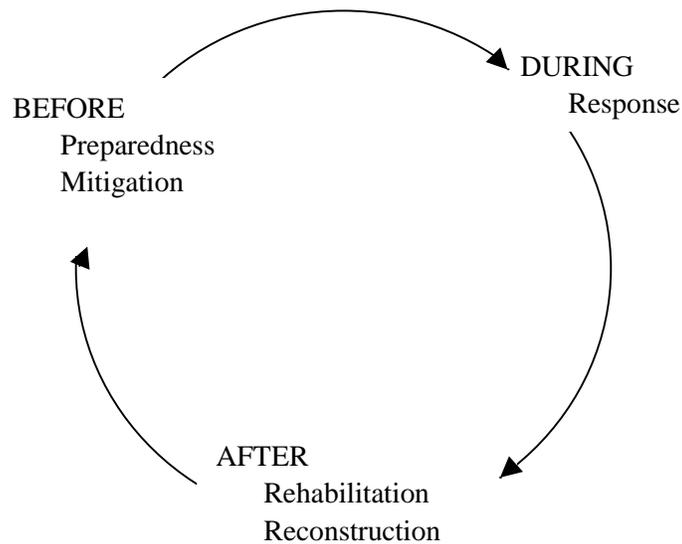
**Emergency:** A phase of a disaster during which lives and/or livelihood are at risk and if no action is taken, lives will be lost.

**Preparedness:** A term that describes the state of readiness to face a hazardous situation.

**Mitigation:** A lessening or easing—before, during, and after a hazard—of the dire consequences that can result.

**Vulnerability:** Susceptibility to the negative consequences resulting from a natural disaster. The many types of vulnerability include physical or material vulnerability (housing, infrastructure), social/organizational (social inequality, institutional capacity), and motivational/attitudinal (“can–do” attitude versus fatalism).

### *The Disaster Cycle*



Disaster experts tell us that the response to disasters can be conceptualized as a cycle with three phases, BEFORE, DURING, and AFTER.

The BEFORE phase is that period of time before a disaster hits, including the time when a warning and/or alert is announced, during which preparation and mitigation activities may take place, with the objective of decreasing people's vulnerability and reducing the negative impacts of disasters. Mitigation activities include actions that, in the long term, will lessen the magnitude of effects of hazards. This might include improved housing construction or reforestation of watersheds. Preparation includes such activities as stockpiling food and water or carrying out a simulation at the community level.

The DURING phase is that period of time during which lives and livelihoods are at risk and lasts until the danger is over.

The AFTER phase is the rehabilitation and reconstruction phase, after the immediate danger is past, when people and communities put their lives, livelihoods, and homes back together.

#### **Step 2.**

Note that in Part One of the disaster preparedness and mitigation training, some concepts were used to outline and help define the role of the Volunteer. Review the Part One objectives (below) using a flip chart. Remind the Trainees of some of the activities that were conducted to meet the objectives.

### **Part One Objectives**

1. To strengthen the ability of Volunteers to maintain their own safety and security during emergency and disaster situations, and
2. To identify the elements of the disaster cycle and key actions to take at its various phases.

Referring to the talk given by the APCD or guest speaker in Part One, Session 1, briefly review the **hazards and vulnerabilities** that can cause significant, large–scale damage in the specific country in which the training is being presented (refer Trainees to the *Types of Hazards/Disasters* handout provided in Part One, Session 1). Note again that these hazards become—and have become, if that is the case—**disasters** if they affect areas where people live, work, and care for their crops and livestock. Review the appropriate words from the vocabulary list. Use visual aids to describe what has happened in the country/community in the past, if they are available.

#### **Step 3.**

Take about 15 minutes to introduce the upcoming independent work by making the following six points:

1. Note that the focus of the upcoming work is community–based disaster preparedness and mitigation.
2. For a community to be prepared for potential disasters or to implement projects that can mitigate the devastating effects of hazards, a first step is to identify the kinds of hazards and vulnerabilities likely to present themselves.
3. Because past natural disasters are often the best indicators of the risks that the community faces in the future, an initial activity should be to investigate the community’s disaster history. It may also be helpful to discuss surrounding communities and contrast their status with that of the target community.
4. This activity involves interviewing three people who have lived in the host community all or most of their lives and compiling the information provided by them. (Alternatively, training center staff might be interviewed about the area where the center is located.)
5. We will review the *Destructive Events Charting Form* that will be used as the information gathering tool for the interview, and then do a practice role play interview.
6. Finally, you will have an assignment to do some interviewing yourselves.

Distribute the *Destructive Events Charting Form* and go through it. If possible, use the local language, at least for key words.

#### **Step 4.**

Take about 15 minutes to role play an interview. Introduce the person to be interviewed and ask Trainees to ask the questions using as much local language as possible. Note the

importance of trying to get as complete a picture as possible of the community’s disaster and emergency history.

**Step 5.**

Explain the actual interviewing practice assignment, including who the Trainees might interview, and date and time (e.g., the next day at 9 a.m.) to complete the assignment. Ask the Trainees to be ready to discuss the results of their interviews.

**Step 6.**

During the report–back time, take about 15 minutes to get the Trainees’ reaction to the interviewing exercise and the information gathered. Probe if needed: Were the Trainees surprised by the answers they received to their questions? Were they scared, excited, upset, concerned about future disaster readiness? Have they had similar experiences before? What were some of their reactions? Provide the Trainees with the handout on *Common Psychosocial Reactions to Disasters*.

**Step 7.**

Based at least in part on the EAP, discuss with the Trainees for up to one hour what they need to be prepared for, where the safest living areas might be, possible alternate evacuation routes, preparation for emergencies that occur regularly (e.g., *the bridge washing out*). Remind them of the importance of safety, security, and advance planning if a disaster should strike during their volunteer service.

(Optional) If you think this would be beneficial to the Trainees given their backgrounds, needs, and the country environment, use a two–event scenario. For example, ask what would happen if a drought occurred, followed by an earthquake, or if an earthquake was followed by fires. Illustrate the points in talking through the scenarios.

**Step 8.**

Identify what the Trainees will be doing during the next session: **Community Natural Disaster Risk Analysis and Mapping.**



## *Trainee Handout*

Page 1 of 3

# *Common Psychosocial Responses to Disasters*

Many issues come to the surface during an emergency. They are both physical and psychosocial. Below are some key psychological and health issues of which Peace Corps Volunteers should be aware in the event of a disaster. Knowing and understanding possible reactions will help Volunteers deal with these issues and keep them safe.

## *Generalized Psychosocial Response in Disasters*

Predicting how people will respond in a disaster is difficult. Again, however, certain generalizations appear to be true:

- Individuals who were unstable before the disaster will probably suffer more as it proceeds.
- People whose families are separated typically recuperate more slowly.
- Professionals who lose status and the ability to practice their trade or skill as a result of becoming refugees may suffer a lack of self–confidence that may never be regained.
- Children probably suffer most initially in almost every way, but are frequently more resilient and adapt more quickly than older persons.
- Often, those who appear to cope most easily in the short term suffer reactions later that may be quite severe.
- Marginalized individuals (the poor, female–headed households, the disabled) are likely to suffer more than those with stronger social ties.

A host of physiological, cognitive, psychological and emotional, and behavioral reactions are possible. They are often linked with the phases of an emergency. During the alarm and mobilization phases, the person might react to the alarm in several ways: shock, anxiety, disorientation, or difficulty communicating. There is an attempt to adjust to the information about the event. During the action phase, there may be various reactive symptoms. These might include a variety of physiological, cognitive, and psychological symptoms. Some typical “coping mechanisms” are listed and briefly discussed below:

- Depression is the most general reaction noted after almost all disasters. The extent of depression will depend upon some of the issues noted above, and also the extent of the disaster itself.
- Anxiety is common during initial, as well as creeping, disasters and following almost every catastrophe. During slow–onset disasters, people quite naturally worry and become anxious about what will happen. After the disaster strikes, there are difficult and

## *Trainee Handout*

### *Page 2 of 3*

important decisions to make about how to return their lives to normal, which also may cause anxiety. Anxiety and depression can be accompanied by sleep disorders and are often linked. Anxiety can also be accompanied by other physiological changes, including increased heartbeat, respiration, and blood pressure; nausea and diarrhea; headaches; dizziness; and other symptoms.

- A short–term feeling of disorientation accompanied by an initial inability to act followed by overactivity is common after sudden–onset disasters. The follow–on activity can manifest itself as heroic volunteerism or chaos, depending upon how well activities are led and organized.
- A change in psychological and social patterns has been particularly noted in traditional cultures’ responses to slow–onset disasters. There is sometimes an attempt to modify local beliefs to explain a disaster or to move to other locations to avoid one.
- A reduction of individuals’ “circles of concern” has been noted with slow–onset disasters. The concern formerly extended to the community or extended family may decrease and come to include only the nuclear family.
- Where large numbers of refugees or internally displaced persons are the result of a disaster, survivors often suffer guilt for having survived while loved ones have died, for having left too soon or too late, or for any other decisions that possibly could have affected the outcome of others. A related, following reaction may be a sense of invulnerability that, coupled with guilt, may cause survivors to take undue risks, and/or increase aggressiveness toward others.
- Panic and hysteria can arise during mass accidents but seem less common after natural disasters.
- Alcoholism, drug abuse, and increased violence are sometimes problems.

## *The Response of Peace Corps Volunteers*

In the event of a disaster, Volunteers may be withdrawn from their communities for safety reasons immediately before or after an event. This can raise important issues for the Volunteers and their communities. The duties and responses of Peace Corps staff and Volunteers in any given emergency are identified in the Evacuation Support Guide and each post’s EAP.

If they experience the disaster simultaneously, Volunteers may suffer the same reactions to it as the local people. They may be stunned and feel guilty for having survived because of their higher economic status or better housing, for example. This may lead them to overreact during relief efforts by working themselves to exhaustion or engaging in counterproductive activity for the sake of keeping themselves occupied. They may also attempt to secure control of the situation from local authorities in the belief that they can organize relief work better or conduct themselves more impartially. On the other hand, Volunteers may be terrified if the local community looks to them for leadership in a situation where they lack the skills, experience, or authority to help in a meaningful way, and the Volunteers’ ability to cope with these new demands may be impaired.

## *Trainee Handout*

*Page 3 of 3*

Volunteers who are not aware of the possibility of increased aggressiveness on the part of beneficiaries following disasters may also respond to this behavior inappropriately by matching that aggression or by imposing unnecessarily restrictive rules or punitive measures on Counterparts or subordinates.

Volunteers may feel alienated if the local community tries to take advantage of them, since neighbors and colleagues may appear unusually friendly but actually harbor underlying motives of desire for material assistance, transport, employment, and so on. The distribution of limited goods and services in developing nations is often based on family and friendship ties rather than on a more objective assessment of need, and Volunteers may have difficulty understanding this and explaining Western standards of equity to associates and neighbors.

It is important for Volunteers to recognize the possible ways in which they might react to a disaster. This will help them and the Peace Corps plan for and address needs if the situation demands.

### **Resources**

National Institutes of Health. *Disaster Work and Mental Health: Prevention and Control of Stress Among Workers*. Bethesda, MD: NIH, 1983.

Peace Corps. “Psychosocial Issues in Disasters.” Washington, DC: Peace Corps, 1983.

## *Trainee Handout*

### *Destructive Events Charting Form*

In the year \_\_\_\_\_, this community, \_\_\_\_\_ (name of community), was affected by the following event/hazard: \_\_\_\_\_.

Describe the kind of event, its name (if it had one):

The losses and damages caused by the event were as follows:

- a. Human lives lost (number of adults and children, if possible):
- b. Number of families affected:
- c. Homes affected (how many, what kind of damage):
- d. Crops lost or damaged (specify crops and quantities affected):
- e. Irrigated or highly productive agricultural lands destroyed or highly degraded:
- f. Land area affected:
- g. Livestock (specify species and quantities affected):
- h. Schools and other public buildings (which buildings, what kind of damage):
- i. Transportation:
- j. Bridges:
- k. Roads:
- l. Parks:
- m. Houses of worship:
- n. Water system:
- o. Forests, natural areas, and watersheds:
- p. Telephone/telegraph services:
- q. Power system:
- r. Jobs:
- s. Income:
- t. Food supply:
- u. Other:

The “emergency” phases versus the long–term consequences were:

## Session 2:

# Preparation for Community Natural Disaster Vulnerability Analysis and Mapping

## Overview

This activity introduces Trainees to a process through which they may come to better understand what issues are important in analyzing a specific community’s susceptibility to and preparedness for a disaster. It then provides the opportunity for Trainees to use the information to map out the specific conditions of their environment.

The session underscores the following: Hazard mapping + vulnerability analysis = risk analysis.

## Objectives

By the end of the session, the Trainees will be able to:

1. Begin developing maps that graphically represent the community, its vulnerabilities (e.g., that take into account the natural disaster hazards that are both close and distant, such as off–shore faults) and its resources related to the hazards it faces.
2. Identify the host community’s primary risk areas and primary human and physical resources in terms of disaster preparedness and response.

## Time

Approximately 2 to 2.5 hours of classroom time over a predetermined number of days.

Approximately 3 hours for field research and related activities.

## Materials

Prepared Flip Chart

- Definition of Community Risk Analysis
- Sample Community Hazard Map

Handouts

- *Community Hazard Analysis and Mapping Steps*
- *Destructive Events Charting Forms* (prepared by Trainees in Session 1)

Blank flip charts and marking pens

Drawing paper and pencils for maps

## Staff

A community member may be invited to attend the presentations and serve as a “reviewer/commentator” during Step 6, which focuses on the presentation of the maps that have been developed.

## Preparation

This and the next session can be included as parts of the language training. If used as language practice, appropriate questioning styles and vocabulary should be introduced and incorporated into the information collection parts of the activities.

As appropriate, community risk and resource mapping might be integrated with the local watershed training if Trainees will be focusing on that subject at some point. In that case, the links and relationships between the condition of the watershed and the vulnerabilities of the community center or roads and bridges leading in and out of town should be highlighted. Even in such training, however, non–water hazards should be discussed.

During pre–training research, investigate whether the community already has a map that can be used to address natural disaster vulnerabilities (often the local public health clinic has one) and whether a topographic map exists. Additionally, many countries already have hazard maps that pinpoint disaster vulnerabilities, and a disaster management plan. In Honduras, for example, each community must have an emergency committee. In the Caribbean, the Caribbean Disaster Emergency Response Agency (CDERA) is the principal disaster management agency. If such agencies exist in–country, this is a good place for the Trainees to start their inquiries.

The way this and the next session’s (follow–on) activities are conducted depend largely on the number of Trainees and their project assignments. Trainees could be responsible for preparing individual maps, using their host families as resources. However, if the group is large and teamwork is desired, the Trainees may be divided into groups of no more than eight participants. The trainer might want to take into account the following questions when structuring the groups:

- Should Trainees be divided according to their home areas in the United States that experience different kinds of disasters?
- Should they be cross–project to allow for the sharing of different technical points of view?
- Should Trainees be project–specific and focus on identified project competencies?
- Should each language class be responsible for a map?
- Would there be any advantage in making the groups gender–specific?
- How does this mapping exercise relate to other community analysis training? Could this exercise be carried out with the participation of community members? Will there be opportunities for the community to analyze the information collected and then apply it in a participatory way?

Trainers should be familiar with the information gathered by the Trainees in Session 1 regarding which destructive events cause particular types of damage and loss because this will be displayed on the maps. Also, read the booklet *Disasters, Planning, and Development*.

In many countries, a community mapping exercise is carried out at the beginning of community– or field–based training and as an integral part of training in community analysis. It is important to coordinate the hazard mapping with other community mapping activities. **However, hazard mapping has a specific purpose and should not be confused with general asset and resources mapping.** Concentrate on mapping the community’s risks for natural disasters and the resources

available to address them, using the maps Trainees have already produced. Be sure to consider risks outside the frame of reference of the community map (e.g., fault lines) if the potential hazard is somewhat geographically remote.

If the hazard mapping will be done with community members using a participatory process, it is strongly suggested that trainers read *PACA: Participatory Analysis for Community Action* (ICE number M0053) and include activities that would permit a comparison of gender-differentiated perceptions of disaster risks and resources.

Before Trainees are sent to a community, it is important to notify the communities that Trainees will be visiting and interviewing community members as part of this exercise. Trainers and Trainees should be involved with this process. Trainers should make appropriate contact with community officials and discuss the importance of Trainees providing an introduction and reason for their inquiries at the outset of their community-based work. (Depending on the country, culture, and community, it might be worthwhile providing some formal introduction that the Trainees can use.)

## Delivery

### Step 1.

- a. Facilitate a short discussion on the purpose of analyzing a community’s needs and resources related to disaster preparedness and management. During the discussion, help Trainees apply what they have learned about community analysis in previous training sessions and activities by focusing on the following questions, and writing key points on the flip chart:
  - What is community analysis?
  - What are some methods that can be used to conduct this kind of analysis?
  - What are the purposes of community analysis?
  - How might a community risk or disaster vulnerability analysis differ from other community analyses?
- b. At the end of the discussion, reveal a working definition of a community risk analysis on the flip chart:

#### ***Definition of a Community Risk Analysis***

This analysis involves gathering and addressing information about the community’s vulnerabilities to natural disasters and the local resources (physical and human) that might be available to provide assistance during emergency or disaster situations.

### Step 2.

- a. Ask Trainees what experience they have had with community mapping, and for what purposes. Introduce the idea of risk maps that will help identify their community’s disaster risks and disaster preparedness and mitigation resources, so that they can plan responses in advance of emergencies.

- b. Show a sample community hazard map. Describe the features that are highlighted (*or* draw a simple sketch of a community and develop with Trainees a list of features one should investigate, based on the types of natural disasters historical surveys have shown occur in this area). Show how those features are represented on the risk map.
- c. Let Trainees know that the focus of this session and the next one will be developing risk maps for the host community. When finished, Trainees will have drawings that not only show the resources in the community but also show the community’s vulnerabilities related to its hazards.
- d. Tell the Trainees that it will be important to use people and records to provide the most comprehensive picture possible of the community’s vulnerabilities and resources the community has in order to be better prepared to face emergencies.

**Step 3.**

Ask Trainees what kind of community resources would be important/useful *after* a natural disaster. Have them make a list (e.g., roads, communication systems, health services, shelters—if homes are destroyed, sources of food, water). Draw on the mapping items presented below for the list.

<b>Mapping Items</b>			
Streets	Schools	Telephone offices	Crops
Paths	Health clinics	Post offices	Cemeteries
Routes	Places of worship	Electric/water plants	Bakeries
Houses	Market places	Rivers and or lakes	Bus depots
Wells	Hospitals	Playing fields	Offices/other building
Garden Plots	Places of employment		

**Step 4.**

Distribute and review the handout describing the steps of their field work. Create this handout, including an introduction of themselves to community elders, the purpose of the exercise, and the process for gathering information for vulnerabilities and resources.

**Step 5.**

Trainees depart to perform their field work of completing the maps to show community vulnerabilities resources.

**Step 6.**

Trainees reconvene and briefly present the map(s) they have made, about five minutes each. Ask questions that will guide Trainees to a complete and accurate product during the next session. If more than one group maps the same community, compare and contrast the maps. Ask the Trainees to identify the strengths and weaknesses of each map. If a community member has been invited to attend the presentations, ask him or her to make comments.

**Step 7.**

Spend approximately 15 minutes practicing both familiar and new words in the local language that relate to the hazard risk maps. Then use the words to review the information collected by Trainees about the hazards and risks this community faces.

**Step 8.**

Using the format below and the results of the earlier session that used the *Destructive Events Charting Forms*, ask the Trainees to help make a list of destructive past events in their area and the related damages and losses. (See example below.)

***Example of Destructive Event Damages and Losses***

Volcanic eruption of 1978

- 45 houses destroyed
- 6 lives lost
- Crops and livestock destroyed

Hurricane Crazy, 1999 (caused flooding of “Big River”)

- 25 houses destroyed
- All crops along the riverbanks lost
- Places of worship washed away
- Bridge into town destroyed
- Power lines and water system damaged

- a. Probe the Trainees to find out if they have enough information to indicate the areas on their maps most prone to damage and loss. For example, during Hurricane Crazy in 1999, 25 houses were destroyed. Do they know where those houses were located? Have they been rebuilt on the same site? How far did the flooding extend? Are those areas still vulnerable? Have any mitigation efforts been instituted since the disaster?
- b. Let the Trainees know that they will be continuing the work on their maps during the next session.

**Resources**



Anderson, M.B., and Woodrow, P.J. *Rising From the Ashes: Development Strategies in Times of Disaster*. Boulder, CO: Lynne Rienner Publishers, Inc., 1998. (ICE number CD056)

Department of Regional Development and Environment, Executive Secretariat for Economic and Social Affairs. *Disasters, Planning, and Development: Managing Natural Hazards To Reduce Loss*. Washington, DC: Organization of American States, December 1990.

Peace Corps. *Participatory Analysis for Community Action*. Washington, DC: Peace Corps, 1996 (ICE number M0053)

## *Trainee Handout*

### *Field Work: Practice Community Hazard Analysis and Mapping Steps*

1. Introduce yourself to community elders or leaders. Describe what you are learning about disaster management and ask their permission to talk with community members so that you can draw a risk map. Get their suggestions of who to meet with.
2. The Trainee meets with representatives from the community and with the institutions involved with disaster preparedness and responses to assess human resources. Other community groups that might be involved—although not represented here—include women’s groups and faith–based groups.
3. The Volunteer determines whether a community map (community map ≠ bounded village unit; hunting areas, fields, and kinship networks may be far away) with hazards identified or a hazard inventory exists. If a hazard map or hazard inventory exists, then the Volunteer acquires it; if not, the Volunteer proceeds with Step 5.
4. With the help of community members, if possible, the Trainee sketches a map showing the vulnerabilities and resources.
5. Volunteer acquires other appropriate maps of the area.

## Session 3:

# Preparation for Community Field Research

## Overview

This activity builds on the last session, which introduced Trainees to a process through which they come to better understand what issues are important in analyzing a specific community’s susceptibility to and preparedness for a disaster. This session provides the opportunity for Trainees to use the information to further develop maps of the specific conditions of their environment.

## Objectives

By the end of the session, the Trainees will be able to:

1. Finalize maps that graphically represent the community, its vulnerabilities and its resources related to the hazards it faces.
2. Discuss risk and resource mapping as effective tools for community–based disaster preparedness training.

## Time

Approximately 2 hours of classroom time over a predetermined number of days.

Approximately 3 hours for field research and related activities.

## Materials

Prepared Flip Charts

- Problem, Results, and Resources Example
- Diagram of the Disaster Cycle

Handouts

- *Community Risk Analysis and Mapping Steps* (distributed last session)
- *Community Risk Analysis Field Research Exercise*
- *Standard Colors and Symbols for Hazard Mapping*
- *Post–Test*
- *DPM Workshop Evaluation*
- *DPM: Integrating Disaster Preparedness and Mitigation In Your Work* (Idea Book) (ICE number M0084)

Trainees’ earlier community maps (Trainees bring to Session 3).

Blank flip charts and marking pens in red and green ink

Audiovisual materials and equipment as required

## Preparation

As in the previous session, before Trainees are sent out to a community, it is important to notify the communities that the Trainees will be visiting and interviewing community members as part

of this session. Trainers and Trainees should be involved with this process. Trainers should make appropriate contacts with community officials and discuss the importance of Trainees providing an introduction and reason for their inquiries at the outset of their community-based work. (If appropriate, depending on the country, culture, and community, provide a formal written introduction that the Trainees can use.)

If Trainees are unable to visit a community, slides should be shown of two typical communities (representing the areas to which Volunteers will be assigned) with hazards.

Get copies of *DPM Idea Book* for participants.

## Delivery

### Step 1.

Through an interactive process, provide information for the next independent task, which involves having the Trainees collect information about the areas of town and its surroundings that were and were not damaged during past destructive events.

- Where might you go to understand what was damaged and what was not? (*Seek vantage points to be able to observe terrain and watershed, both areas that are vulnerable or contribute to vulnerability.*)
- Why is it important for a community to know where its most vulnerable areas are prior to an emergency or disaster? (*In order to evacuate those in danger or take other preventive actions to reduce damage and loss; to plan and carry out mitigation activities.*)

### Step 2.

Note the importance of recognizing and being able to access local resources during the BEFORE phase of the disaster cycle by giving an example (see below).



***Example of the Importance of the  
Early Knowledge of Local Resources in a Disaster***

In many communities in Honduras, annual flooding is a reality. Year after year, the flooding, along with massive mudslides, has gotten steadily more serious and widespread as deforestation and traditional agricultural practices have depleted the forests and hillsides throughout the country. The massive rainfall accompanying Hurricane Mitch in 1998 resulted in a disaster of gigantic proportions destroying homes, bridges, roads and crops and flooding towns and villages in nearly the entire country. Innumerable communities were cut off by fallen bridges, washed–out roads and raging rivers where streams used to be. Cities, towns and villages were left on their own. It was impossible for adequate assistance to arrive. These communities found themselves solving a myriad of problems, including sheltering the homeless, providing medical care to the sick and injured, supplying food and clean water to local residents, reestablishing electric service, and other activities. Most communities were caught unprepared, although the ability for even the poorest community to pull together and solve their most pressing problems was impressive. As a result of Hurricane Mitch, many communities are taking disaster preparedness seriously, and have put together emergency plans which include identification of the resources they have on hand to face future problems.

**Step 3.**

- a. Present a flip chart that reads, Problem, Results, and Resources. Ask Trainees to help fill in some sample information. Explain that this is the type of information that they will be gathering from the community. (Provide one or more of the following examples on a flip chart.)

***Problem, Results, and Resources Example***

**Problem:** Bridge washed away

**Result:** No access to town, no food coming in

**Resources:** (Canoes are at M. Bouhafa’s house; the silos at the agricultural co–op have enough grain for two weeks.

**Problem:** Electric lines down

**Result:** No power for refrigeration at health center for vaccines

**Resources:** There are small private generators in the homes of Haj Jabra and Mme. Zohra.

**Problem:** 25 homes destroyed by flooding and high winds

**Result:** 25 homeless families, sick children

**Resources:** Shelter at school, cots available at the Forest Service retreat camp, healthclinic has one month supply of basic medicines and supplies on hand.

- b. Tell Trainees that it will be important to use people and records to provide the most complete picture possible of the risks and resources the community has to be better prepared to face future emergencies.
- c. Ask the Trainees to refer to the handout *Community Hazard Analysis and Mapping Steps* once more. Inform them that they should use the handout to help guide them in their next round of field research. Let them know that you have spoken to community leaders about the exercise, but Trainees, now, need to introduce themselves (provide them with a formal written introduction if appropriate).
- d. Let the Trainees know how much time they have available to gather information related to a specific problem in the local community. (This will be important for the end of this session). Inform the Trainees when to meet again to finalize the maps and conclude this aspect of the training.

#### Step 4.

Trainees will depart to perform their field research.

#### Step 5.

- a. After the group reconvenes, give each team five to 10 minutes to present the information they have gathered, keeping track of that information on a flip chart under the categories: Problem (there should be congruence in the problems that they focus on), Results, and Resources.
- b. Provide approximately 30 minutes for the Trainees to color in the community map (or transparencies so that they can both be copied and used on an overhead). Only enter information that each Trainee or team (if divided into groups) has gathered. The actual coloring in of the community hazard map should follow guidelines established by the local civil defense or emergency management agency. The colors and symbols used to represent various conditions and objects should be standardized. If there are no standardized colors or symbols within the country, the ideas presented in the handout, *Standard Colors and Symbols for Mapping Exercise* presented at the end of the session can be used.)
- c. Have the group indicate risks and vulnerable areas using red markers and physical resources using green markers on their already–completed community map. Process the information that the map displays. Have the group list human resources on a separate flip chart and include these resources on the map, if appropriate (e.g., women’s groups).

#### Step 6.

Wrap up the exercise with a discussion about what the Trainees learned from the mapping experience. Use these questions as a guide:

- Have there been surprises?
- Has the activity given you an opportunity to learn more about the community?
- Have you reached out to new people? How were those experiences? Who did you miss?
- Have you learned more about the culture?

- Is this a tool you could use when you begin service in your sites?
- Who could you do this exercise with in your sites (organized groups, neighbors, municipal workers, schools, etc.)?
- When is the appropriate time for a new Volunteer to undertake a mapping experience at their new site?
- Has this exercise provided information that will be useful in preparing for future natural disasters? In what ways?

### Step 7.

- a. Conduct an all–group question/answer period on what issues affect the ability to gather information and a discussion on how the information could be used in the Trainees’ particular areas of work (e.g., education, environment, community development). During the first part of the discussion (issues that affect their ability to gather information), draw out and discuss cultural and personal issues. Examples include: people are shy, they only seem to say what they think is acceptable to hear, only the men would provide information, and so on.
- b. For the discussion on how to use the information in work, display the flip chart of the Disaster Cycle Diagram. Have the Trainees identify their work areas, brainstorm what activities they would most likely be involved with, and identify where those activities would be placed on the cycle. For example:
  - Trainees who will work as Volunteers in education can brainstorm basic awareness and preparedness activities for students and parents.
  - Volunteers assigned to a soil conservation activity can brainstorm ways to integrate disaster preparedness and mitigation concepts into community work in soil conservation.
  - Volunteers involved in a school construction project can help the community think through the best place to locate the school and how to make it as disaster–resistant as possible as well as uses it might serve in the emergency phase.

### Step 8.

Pass out the handout *Appropriate Roles for Peace Corps Volunteers in Disaster Management*. Have the Trainees review the materials for a few minutes and then ask if there are any follow–up questions. If appropriate, note that a more intensive training on this subject will be conducted to further prepare them for dealing with natural disasters in an IST.

### Step 9.

Have the Trainees evaluate the training experience as a whole by completing the post–test and evaluation forms. Distribute *DPM Idea Book*.

## Resources

Anderson, M.B., and Woodrow, P.J. *Rising From the Ashes: Development Strategies in Times of Disaster*. Boulder, CO: Lynne Rienner Publishers, Inc., 1998. (ICE number CD056)

Department of Regional Development and Environment, Executive Secretariat for Economic and Social Affairs. *Disasters, Planning, and Development: Managing Natural Hazards To Reduce Loss*. Washington, DC: Organization of American States, December 1990.



## *Trainee Handout*

### *Community Risk Analysis Field Research Exercise*

It is important to use people and records to provide the most comprehensive picture possible of community vulnerabilities and resources related to disaster preparedness and mitigation. This exercise requires you to seek information on the history of disasters in the community through contacts with community leaders and elders as well as representative institutions involved in disaster preparedness.

With assistance from the trainer, arrange to meet with at least two identified community contacts with the objective of seeking the following kinds of information about community hazards or destructive events that have affected the community:

- What kinds of hazards seem to occur with greater frequency in the community?
- Are there maps or inventories of these hazards in community records?
- What kinds of losses or damages has the community faced as a result of these hazards?
- Which areas of the community appear to be hardest hit by these hazards?
- Which people seem to be most affected?
- What problems did the community face during recent emergencies?
- How was the community able to respond during the most recent emergency?
- What resources were on hand and put to use?
- What resources were needed, but not available?

## *Trainee Handout*

# *Standard Colors and Symbols for Hazard Mapping Exercise*

**Vulnerability/hazard maps use colors and symbols, such as those listed below:**

Bakeries	loaf of bread
Bus depots	a little bus
Cemeteries	little tombstone
Crops	wheat stalk
Electric/water plants	gray building with capital E (or language–appropriate letter)
Health clinics	white square with red cross or crescent (depending on location)
Hospitals	capital H (or language–appropriate letter)
Houses	house–shaped figures
Market places	capital M (or language–appropriate letter)
Offices/other buildings	little building (distinct from houses)
Paths	brown lines
Places of worship	cross or crescent (depending on location)
Playing fields	brown patch
Post offices	box with PO in it (or language–appropriate initials)
Rivers and/or lakes	blue patch (lake) or line (river)
Routes	heavier black line
Schools	brown square
Streets	black lines
Telephone offices	capital T (or language–appropriate letter)
Wells	bucket and rope

## *Trainee Handout*

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# *Appropriate Roles for Peace Corps Volunteers*

The following pages identify the roles that Peace Corps Volunteers may take in disaster management. Many roles are not hazard–specific and would be appropriate for either full– or part–time assignments. Those that are, are so noted.

### **Appropriate roles in various hazard situations:**

**Capacity–building.** Volunteers can utilize community assessments to understand the range of local knowledge about disasters and the capacity to mitigate them. Building on local knowledge, volunteers can further strengthen local capacity by **starting** up and replicating such knowledge and practices.

**Public awareness.** Volunteers can be trained and provided with appropriate materials to conduct public awareness workshops on the nature and risk of hazards and what can be done to mitigate and prepare for them.

**Preparedness planning.** Volunteers can work with the community to develop a local disaster preparedness plan (such as a checklist of actions and people responsible for them). Any preparedness activity, no matter how small, can potentially save lives and reduce property damage.

**Economic protection.** Economic development specialists can encourage the establishment of lending institutions to provide money for housing improvement and encourage the poor to establish cash reserves for possible emergencies. Co–ops are a major source of reconstruction loans to the poor who often cannot qualify for other financial assistance.

**Search and rescue activities.** Volunteers can help form committees that can offer assistance in the wake of a disaster.

**Distribution of relief.** This is an important role in the aftermath of most disasters.

**Distribution of shelter materials.** Given the desire of individuals to hold onto what they have, Volunteers can distribute more appropriate and/or safer building materials.

**Disaster assessment.** With training in disaster management, Volunteers can be instrumental in providing needed information to local or international assistance groups about what needs to be done.

**Translation services for foreign disaster officials.** Volunteers are known for their language proficiency after short periods of time in–country. This ability can be fundamental when outside officials and workers enter the country to help following a disaster.

**Site selection.** With adequate training in disaster management, and particularly with a background in planning or geology, Volunteers can help city planners conduct risk and vulnerability analyses and advise urban dwellers about safe living areas.

## *Trainee Handout*

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### *Additional roles specific to earthquakes:*

**Housing improvement.** If Volunteers have training as engineers and architects, they can play important roles in planning and executing programs to improve local housing and building construction methods to an earthquake–resistant standard in both mitigation and reconstruction programs.

**Structural surveys.** Engineers and architects also can assist in assessing building safety before and after earthquakes.

**Monitoring seismic events.** If Volunteers have special training and background in this area, they may be able to assist authorities in monitoring seismic events. They might also help with the translation of scientific data at the community level.

**Translation services for foreign disaster officials.** Volunteers are known for their language proficiency after short periods of time in–country. This ability can be fundamental when outside officials and workers enter the country to help following a disaster.

## *Trainee Handout*

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### *Additional roles specific to volcanic eruptions:*

**Early warning.** Volunteers can be trained and provided with appropriate materials to facilitate early–warning messages and to tailor those messages to the needs of the community.

**Evacuation.** Volunteers can assist with orderly evacuations.

**Housing reconstruction.** Adequately trained Volunteers (i.e., those that have an engineering or construction background) can provide technical assistance to volcano victims.

**Translation services for foreign disaster officials.** Volunteers are known for their language proficiency after short periods of time in–country. This ability can be fundamental when outside officials and workers enter the country to help following a disaster.

## *Trainee Handout*

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### *Additional roles specific to floods:*

**Agricultural and food protection.** Volunteers promoting vegetable gardening can introduce flood-resistant, culturally acceptable crops. Agronomists can work with farmers to select alternative farming patterns or flood-resistant crops that mature at times of low risk.

**Harvest protection and food storage.** Appropriate technology specialists can help small farmers build appropriate, strong grain silos to help protect harvests until they are used and/or sold.

**Forestation.** Forestry Volunteers can help reduce vulnerability through reforestation efforts that may significantly reduce rapid rain runoff and subsequent flooding. Volunteers can also promote the use of fuel-efficient woodstoves, if appropriate. This activity helps to lessen deforestation pressure.

**Translation services for foreign disaster officials.** Volunteers are known for their language proficiency after short periods of time in-country. This ability can be fundamental when outside officials and workers enter the country to help following a disaster.

## *Trainee Handout*

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### *Additional roles specific to hurricanes and cyclones:*

**Food and agricultural planning.** Volunteers promoting vegetable gardening can introduce flood–resistant crops that are culturally acceptable. Agronomists can work with farmers to select alternative farming patterns or flood– and wind–resistant crops that mature at times of low risk.

**Harvest protection.** Appropriate technology specialists can help small farmers build strong grain storage facilities to help protect harvests until they are sold.

**Reforestation and watershed management.** Volunteer foresters can help reduce vulnerability through reforestation designed to reduce rapid rain runoff and subsequent flooding. On lowlands, Volunteers can promote the strategic planting of trees to serve as windbreaks.

**Housing improvement.** Volunteers with a background in engineering, architecture, or the building trades can help families to strengthen existing structures and make them more wind– and water–resistant. Much can be done at little cost, using locally available materials.

**Housing reconstruction.** Volunteers can provide technical assistance to hurricane victims, especially building tradesmen, to improve the performance of new structures and to optimize site selection.

**Building surveys.** Volunteer engineers or architects, if properly trained, can assess the survivability of large buildings such as schools and churches that are commonly designated as hurricane shelters and then work with the community to strengthen structures or identify alternative protection strategies.

**Translation services for foreign disaster officials.** Volunteers are known for their language proficiency after short periods of time in–country. This ability can be fundamental when outside officials and workers enter the country to help following a disaster.

## *Trainee Handout*

*Page 6 of 9*

### *Additional roles specific to droughts:*

**Agricultural and food protection.** Volunteers promoting vegetable gardening can introduce drought–resistant, culturally acceptable crops. Agronomists can work with farmers to select alternative farming patterns or drought–resistant crops.

**Food storage.** Appropriate technology Volunteers can provide small farmers with technical assistance to build appropriate grain silos to help protect harvests.

**Translation services for foreign disaster officials.** Volunteers are known for their language proficiency after short periods of time in–country. This ability can be fundamental when outside officials and workers enter the country to help following a disaster.

*Trainee Handout*

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*Volunteer Disaster Roles Comparison Chart*

While many of the roles of Volunteers are similar across the various types of disasters, there are differences that correspond with the effects of each type of disaster. Trainees/Volunteers should be encouraged to explore the specifics of each of the types of activities in which they might get involved according to the disaster(s) that they are most likely to encounter.

<b>Type of Disaster</b>	<b>Effects</b>	<b>Roles for Volunteers</b>
Earthquake	<p><b>Primary effects</b></p> <ul style="list-style-type: none"> <li>• Violent ground movement</li> <li>• Structural movement</li> <li>• Structural failure</li> <li>• Structural collisions</li> <li>• Ground liquification</li> <li>• Injury and death by structural collapse</li> </ul> <p><b>Secondary effects</b></p> <ul style="list-style-type: none"> <li>• Landslides</li> <li>• Fires</li> <li>• Tsunamis</li> <li>• Floods</li> </ul>	Public awareness Preparedness planning Economic mitigation Search and rescue activities Distribution of relief Distribution of shelter materials Disaster assessment Translation services Housing site selection Housing improvement Structural surveys Monitoring of seismic events
Cyclone	<p><b>Primary effects</b></p> <ul style="list-style-type: none"> <li>• Destruction of human settlements</li> <li>• Death and injuries by drowning, structural collapse, flying objects</li> </ul> <p><b>Secondary effects</b></p> <ul style="list-style-type: none"> <li>• Mudslides</li> </ul>	Public awareness Preparedness planning Economic protection programs Housing reconstruction Assistance to other agencies as needed (reconstruction and recovery)
Volcano	<p><b>Primary effects</b></p> <ul style="list-style-type: none"> <li>• Damage from volcanic ash (breathing difficulties, contamination of water supplies, electrical storms, collapsing roofs)</li> <li>• Tsunamis, flash floods, earthquakes, rockfalls, mudflows</li> <li>• Sideways directed volcanic explosions (lateral blasts) that can shoot large pieces of rock at very high speeds for several miles</li> </ul>	Public awareness Preparedness planning Site selection Agricultural and food protection Harvest protection Food storage Forestation Economic protection Assistance to other agencies



*Trainee Handout*

Type of Disaster	Effects	Roles for Volunteers
Flood	<p><b>Primary effects</b></p> <ul style="list-style-type: none"> <li>• Destruction of vulnerable human settlements (the most important determinant of vulnerability is the level of poverty)</li> <li>• Drowning</li> <li>• Crop and food damage</li> <li>• Undermine farmland</li> <li>• Wash away irrigation systems</li> <li>• Change in the course of rivers or streams</li> </ul> <p><b>Secondary effects</b></p> <ul style="list-style-type: none"> <li>• Mudslides</li> <li>• Epidemics</li> </ul>	<p>Public awareness                      Preparedness planning                      Site selection                      Agricultural and harvest/food protection                      Food storage                      Forestation                      Economic protection                      Assistance to other agencies</p>
Hurricane	<p><b>Primary effects</b></p> <ul style="list-style-type: none"> <li>• Destruction of vulnerable human settlements</li> <li>• Drowning</li> <li>• Destruction of bridges and roads</li> <li>• Destruction of trees and forest land</li> <li>• Power line destruction and damage</li> <li>• Destruction of agricultural land, crops, food stuffs</li> </ul> <p><b>Secondary effects</b></p> <ul style="list-style-type: none"> <li>• Mudslides</li> <li>• Epidemics</li> </ul>	<p>Public awareness                      Preparedness planning                      Site selection                      Food and agricultural planning                      Reforestation and watershed management                      Economic protection                      Housing improvement/reconstruction                      Building surveys                      Assistance to other agencies</p>

*Trainee Handout*

Type of Disaster	Effects	Roles for Volunteers
Drought	<p><b>Primary effects</b></p> <ul style="list-style-type: none"> <li>• Reduced crop, rangeland, and forest productivity</li> <li>• Increased fire hazard</li> <li>• Reduced water levels</li> <li>• Increased livestock and wildlife mortality rates</li> <li>• Damage to wildlife and fish habitat</li> </ul> <p><b>Indirect impact of the above</b></p> <ul style="list-style-type: none"> <li>• Reduced income for farmers and agribusiness</li> <li>• Increased prices for food and timber</li> <li>• Unemployment</li> <li>• Reduced tax revenues</li> <li>• Increased crime</li> <li>• Foreclosures on bank loans to farmers and businesses</li> <li>• Migration</li> <li>• Malnutrition and famine</li> <li>• Disaster relief programs</li> </ul>	<p>Public awareness                      Preparedness planning                      Agricultural and food protection                      Food storage                      Economic protection                      Assistance to other agencies</p>

## *Trainee Handout*

### *Post–Test*

**Participant #** \_\_\_\_\_

1. How do you think Peace Corps Volunteers can help communities better prepare for and minimize the impact of (a hurricane, earthquake, drought, etc. Choice/s should be country–dependent)?
  
2. Define the following terms:
  - a. Hazard –
  - b. Disaster –
  - c. Emergency –
  - d. Vulnerability –
  
3. Typically, there are actions that one can take BEFORE, DURING, and AFTER a natural disaster. Please identify some activities in each category:  
  
Before:    a)  
              b)  
  
During:    a)  
              b)  
  
After:      a)  
              b)
  
4. What is a community risk analysis?
  
  
5. Identify some activities that might be included in a community risk analysis in \_\_\_\_\_ (name of country).

## *Trainee Handout*

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### *Pre–Service Training DPM Workshop Evaluation*

The purpose of the evaluation is to help us improve the disaster management training program. Your answers are confidential, so please answer the questions with candor. Use the back of this questionnaire if additional space is needed to write responses. Thank you for your help.

#### **Training Content**

1. Do you think that you have a better understanding of the importance of disaster preparation and mitigation? \_\_\_ Yes \_\_\_ No

2. Do you have a better appreciation for the role that Volunteers can play in helping a community to prepare for and mitigate natural disasters? \_\_\_ Yes \_\_\_ No

3. Please rate the quality of the information of the following sessions:

**Part One, Session 1: Introduction to Disaster Management**

Excellent      Good      Average      Below Average      Poor

**Part One, Session 2: Overview of Disaster Preparation and Mitigation**

Excellent      Good      Average      Below Average      Poor

**Part One, Session 3: Volunteer Safety and Security**

Excellent      Good      Average      Below Average      Poor

**Part Two, Session 1: Review of Basic Disaster Terminology and Historical Events**

Excellent      Good      Average      Below Average      Poor

**Part Two, Session 2: Preparation for Community and Mapping Natural Disaster Vulnerability Analysis**

Excellent      Good      Average      Below Average      Poor

**Part Two, Session 3: Preparation for Community Field Research**

Excellent      Good      Average      Below Average      Poor

4. The objectives of the PST were to:

a. Strengthen the ability of Volunteers to maintain their own safety and security during emergency and disaster situations.

b. Identify the disaster cycle elements and key actions to take at various phases.

## Trainee Handout

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- c. Increase each Volunteer's understanding of their individual communities' historical settings and conditions with regard to specific types of disasters.
- d. Increase each Volunteer's understanding of what their community needs to do to prepare for the eventuality of a disaster (understanding of community vulnerability analysis).
- e. Increase Volunteers' ability to conduct a community analysis.

Were the main objectives of the training met? \_\_\_ Yes \_\_\_ No

If you believe that one or more of the objectives were NOT met, please identify which one(s) and explain why.

- a. \_\_\_\_\_  
\_\_\_\_\_
- b. \_\_\_\_\_  
\_\_\_\_\_
- c. \_\_\_\_\_  
\_\_\_\_\_
- d. \_\_\_\_\_  
\_\_\_\_\_
- e. \_\_\_\_\_  
\_\_\_\_\_

## Organization of the Training

How would you rate:

- 1. The overall length of the training?  
Just right      Too long      Too short
- 2. The overall training format?  
Just enough variety      Not varied enough      Disjointed
- 3. The overall quality of handouts and materials?  
Excellent      Good      Average      Below Average      Poor
- 4. The training site?  
Very comfortable      Somewhat comfortable      Uncomfortable

Please comment: temperature, amenities, size, location, etc.



## *Appendix 1:*

# *Types of Hazards/Disasters: Effects, Lessons Learned, and Appropriate Actions*

## *Earthquakes*

Earthquakes are one of the most dangerous and destructive forms of natural hazards. They strike with sudden impact and little warning. They may occur at any time of day or on any day of the year. Earthquakes can devastate an entire city or a region of hundreds of square kilometers. They can reduce buildings to piles of rubble in seconds, killing and injuring their inhabitants. This information sheet provides some basic information on the primary and secondary effects of earthquakes as well as an overview of preparedness and mitigation actions.

### **Primary Effects of Earthquakes**

The onset of a large earthquake is initially signaled by a deep rumbling, followed shortly by a series of violent motions in the ground. Often the ground fissures, or cracks, and there can be large permanent displacements horizontally—sometimes as much as six to nine miles (10 to 15 kilometers). As the vibrations and waves continue to move through the earth, structures on the earth’s surface are set in motion. Each type of structure responds differently, depending on the type of materials of which it is made. When the seismic waves strike, the earth begins to move backward and forward along the line of contact (shear line). The lower part of the building on the earth’s surface moves immediately with the earth. The upper portion, however, initially remains at rest; thus the building is stretched out of shape. Gradually, the upper portion tries to catch up with the bottom. As it does, the earth moves in the other direction causing a “whiplash” effect, speeding up the top of the building, and creating a vibration known as resonance. The resonance can cause structural failure in itself; adjacent buildings having different response characteristics (caused by different building materials) can vibrate out of phase and pound each other. The walls of buildings without adequate lateral bracing frequently fall outward, allowing the upper floors or roof to collapse into the inside of the structure. Another primary effect, known as liquefaction, can occur when loose sandy soils with a high moisture content separate when shaken by an earthquake. The water then moves upward, resulting in a surface with a quicksand-like consistency. Heavy structures resting on these soils will slowly sink into the ground.

### **Secondary Effects of Earthquakes**

Often as destructive as the earthquake itself are the secondary effects such as landslides, fires, tsunamis, and floods. Landslides are especially damaging and often account for the majority of lives lost. Tsunamis are generally of less concern, except in the Pacific Basin. A tsunami is a large sea wave caused by an earthquake abruptly lifting the ocean floor. The waves move outward at high velocity and can cross thousands of miles before they run up on shore. At sea, their low wave height gives little evidence of their existence. As they approach land, however, their velocity decreases and their height increases. In this way, a five-foot crest moving at 370 miles per hour (mph) (600 kilometers per hour [kph]) in the open ocean becomes a devastating 3,200-foot (50-kilometer) wave moving at 31 mph (50 kph) when it reaches shore. Fire is another

concern immediately following an earthquake because of severed electrical lines and broken gas mains. In recent years, devices have been installed in most of the world’s major cities that shut down gas and electric supply lines automatically if an earthquake strikes. Yet the threat still exists in many smaller cities and the squatter settlements of larger cities where open fires are used for cooking, heating and lighting.

## **Lessons Learned**

It is important to recognize that different cultures explain the existence and appearance of earthquakes in various ways, including the wrath of a god, weather patterns, and modern interference with nature. These cultural elements should be taken into account when providing preparedness or mitigation assistance; however, certain lessons have been learned and should be applied:

- When survivors assume that nothing can be done to avoid the impact of an earthquake, they often want to build structures in the same manner as before.
- Because rebuilding usually takes place in the first months following an earthquake, technical assistance and improvements need to take place soon after the earthquake.
- Many survivors use building materials from their old home because they see these houses as providing greater shelter than tents and allowing them to keep something they had before the earthquake.
- Earthquakes and the threat of continuing tremors rarely are sufficient reason to evacuate an affected area.
- Health threats in the aftermath are exaggerated. Relocation into camps poses a much greater threat in the outbreak and spread of communicable diseases.
- Reconstruction often takes longer than estimated, and a full recovery may take years.
- Outbreaks of cholera do not follow earthquakes. Cholera must be endemic to a community beforehand.
- Waterborne diseases do not increase as a result of earthquakes.
- Extensive food aid is rarely required after an earthquake.
- Used clothing is almost never needed, is usually culturally inappropriate and, although accepted by many disaster victims, is almost never worn.
- Blankets can be useful but can usually be found locally and do not need to be imported.
- Assistance by outsiders is most effective in the reconstruction period, not the emergency phase.
- Most needs are met by the victims themselves or their local governments.
- In general, victims do not respond to disasters with abnormal behavior. Earthquakes do not incite panic, hysteria, or rioting.

## **Pre–Disaster Activities**

A great deal can be done to prevent earthquakes from becoming disasters. First, it is important that various members of the public come to understand earthquakes. Three levels of commitment are needed:

1. Policymakers need to create strategic development and investment programs;
2. Communication programs need to reach the general public to inform and educate; and
3. Technical assistance must be available for responding to before–and–after needs.

Attention to disaster assistance has become a priority of many government policy and development officials today. One activity that is necessary in advance of any disaster and which is addressed in this training, is mapping the possible risks and response of the community. Mapping should consider the conditions that could contribute to a particularly risky environment in the face of a disaster, such as structures and power lines. Specific actions necessary to reduce earthquake damage include:

- Developing low–cost construction techniques that are seismic–resistant.
- Introducing improved construction techniques to the building industry and to the public.
- Determining which sites are safe for construction through analysis of the location (e.g., not downstream from dams and snowpacks), soil type, and geologic structure.
- Instituting incentives to remove unsafe buildings and buildings on unsafe sites or to upgrade their level of safety.
- Instituting incentives to encourage future development on safer sites and safer methods of construction through land use controls (zoning); building codes and standards and means of enforcing them; favorable taxation, loans, or subsidies to qualifying building methods and sites; and land development incentives.
- Reducing possible damage from secondary effects by identifying and restricting construction on potential landslide sites; installing devices that will keep breaks in electrical lines and gas mains from producing fires; and verifying the capability of dams to resist earthquake forces and upgrading them as necessary.

## Preparedness Activities

Earthquake preparedness activities include those that focus on education and planning:

- Training teams for search and rescue operations
- Training teams for disaster assessment
- Identifying safe sites where people living in areas threatened by landslides in secondary tremors could be relocated
- Training adequate personnel in trauma care
- Maintaining stocks of trauma–related medical supplies
- Reviewing and upgrading the structural soundness of facilities that are essential for the operation of disaster response, such as hospitals, fire stations, government buildings, communications installations
- Preparing plans and equipment for alternative water supply as necessary
- Preparing plans for clearing streets on a priority basis to provide emergency access
- Preparing emergency communication systems as well as messages to the public regarding matters of health, safety, and security
- Training teams to determine if buildings are safe for reoccupancy

## Post–Disaster Activities

A number of lessons for post–disaster activities have been learned from experience. The response should include activities outlined in the preparedness stage, but the initial emphasis during the post–disaster time period should be on search and rescue of victims. There should be an attempt to account for all members of the affected population and to provide emergency medical assistance. Additionally, it will be important to conduct a damage and needs assessment and to provide relief to survivors. Responses in this last area can involve:

- Financial assistance
- Reopening roads
- Reestablishing communications to quickly get information to the public about what they should do and where they can go for services
- Making contact with remote areas
- Conducting disaster assessment
- Providing building materials for reconstruction

Most long–term recovery activities involve local and national authorities. National authorities will also determine the need for international assistance. These activities include:

- Repair and reconstruction of “lifelines”—water, sewer, and electrical services and roads
- Technical, material, and financial assistance for the repair and reconstruction of residential and public buildings
- Economic programs that create jobs to help rejuvenate the economy
- Financial assistance to survivors, including lines of credit and assistance to businesses to enable them to participate in recovery efforts

## References for Earthquakes

Federal Emergency Management Agency website ([www.fema.gov](http://www.fema.gov)). “FEMA Preparedness.” Washington, DC: FEMA, 2000.

United Nations Disaster Relief Office. *Shelter After Disaster*. New York: UN, 1982.

Peace Corps. Materials from the Mombasa Disaster and Development Conference. Washington, DC: Peace Corps, 1983.

## Cyclones

Cyclones are among the most awesome events that nature can produce and pose a major threat to lives and property in many parts of the world. Every year, these sudden, unpredictable, violent storms with high winds cause widespread devastation to coastlines and islands in their erratic paths. A cyclone’s destructive work is done by the high wind, flood–producing rains, and associated storm surges. A cyclone is a tropical storm in which the winds reach speeds of more than 74 mph (120 kph) and blow in a large spiral around a relatively calm center or “eye.” Simply stated, cyclones are giant whirlwinds in which the air moves in a large, tightening spiral around a center of extreme low pressure, reaching maximum velocity in a circular band extending outward 20 to 30 miles (30 to 50 kilometers) from the edge of the eye of the cyclone.

Near the center, winds may gust to more than 200 mph (320 kph), and the entire storm dominates the ocean surface and lower atmosphere over tens of thousands of square miles. Devastating floods from extremely heavy rainfall often accompany tropical cyclones. Flash floods of great volume and short duration may result from the cyclone’s rain, especially in hilly or mountainous terrain. Runoff from the intense rainfall accumulates quickly in restricted valleys and flows rapidly downstream, often as a large wave. Flood flows frequently contain large concentrations of sediment and debris. Storm surges, rapid rises of the ocean level as the cyclone approaches which can bring a wall of water as high as 65 feet (20 meters), cause the most devastating type of cyclone–related flooding. Tidal floods can also be caused by the combination of waves generated by cyclone winds and flood runoff resulting from the heavy rains that accompany cyclones. These floods may extend over large distances along a coastline, but their duration is usually short because of tide fluctuations.

### Primary Effects of Cyclones

Disasters from cyclones occur when the human settlements are vulnerable. Vulnerability is determined by the exposure to the storms, the degree to which the houses and other structures can be damaged, and the likelihood that secondary effects could occur. Urban and rural communities in unprotected, low–lying coastal areas or on river floodplains exposed to cyclones are considered vulnerable. Poverty and underdevelopment are key source factors in determining vulnerability, given the structural weakness of the homes and the higher probability of homes in exposed locations.

Most loss of life from cyclones is due to drowning, either from the rise in sea water inundating the land or from floods resulting from the excessive rainfall. The number of deaths is significantly higher in developing countries where communications are poor, warning systems and evacuation plans are inadequate, and crowding is commonplace. Deaths and injuries also occur from structural collapse or flying objects, with devastating effects on homes and buildings, agriculture, critical facilities, and lifelines. The most dramatic impact of cyclones is the damage they cause to buildings, which are pulled apart by winds moving swiftly around and over them, lowering the pressure on the outside and creating suction on the walls and roof. Safety also is compromised by the damage to or destruction of public installations and facilities, such as water and electrical plants, hospitals, and police stations. There also may be damage to agricultural land, crops, and foodstuffs.

## Secondary Effects of Cyclones

A secondary effect of flooding due to cyclones is mudslides, which are caused by supersaturation of deforested or stripped hillsides. Significant loss of life may occur in massive mudslides resulting from the torrential rains, especially in squatter settlements located in floodplains.

## Lessons Learned

The following are lessons learned.

- Outbreaks of cholera do not follow cyclones. Cholera must be endemic to a community beforehand.
- Waterborne diseases do not increase as a result of cyclones.
- Extensive food aid is rarely required after a cyclone.
- Used clothing is almost never needed, is usually culturally inappropriate and, although accepted by many disaster victims, is almost never worn.
- Blankets can be useful but can usually be found locally and do not need to be imported.
- Assistance by outsiders is most effective in the reconstruction period, not the emergency phase.
- Most needs are met by the victims themselves or their local governments.
- In general, victims do not respond to disasters with abnormal behavior. Cyclones do not incite panic, hysteria, or rioting.
- Cyclone relief and reconstruction programs should be integrated with long-term development programs.
- When properly executed, reconstruction assistance can provide a strong stimulus to recovery and a base for future development work.
- Reconstruction programs should seek to reduce social and physical vulnerability to future disasters.
- Reestablishment of the local economy, income security, and agriculture are usually more important to cyclone victims than materials assistance.
- Churches, schools, and other large buildings that are often designated as cyclone shelters are usually not safe. The number of deaths attributed to destroyed or flooded shelters is alarming. Most experts agree that the best alternative is adequate warning and evacuation of threatened areas.

## Pre–Disaster Activities

Reducing the harmful effects of a cyclone requires actions on three fronts:

1. Reducing the vulnerability of physical settlements and residential structures;
2. Reducing the vulnerability of the economy; and
3. Strengthening the social structure of a community so that coping mechanisms can help absorb the impact of the disaster and promote rapid recovery.

The first step in reducing vulnerability for human settlements is to identify the high-risk areas. This is done by relating the effects of the cyclone to the terrain and to the probability that a

cyclone will occur. This activity is addressed through mapping the community. The second step is to identify those communities that are particularly susceptible to damage or destruction, particularly those of the poor. Reduction of vulnerability may also involve:

- Development of extensive public awareness programs to inform the public about the hazards and illustrate what can be done to prevent a disaster
- Land–use zoning to control development
- Construction of protective works, such as embankments, to protect from flooding
- Restrictive development regulations to ensure that any development meets certain standards that take into consideration the threat to the site
- Land swaps, which would provide alternatives to development of the site
- Imposition of design criteria or building standards to govern construction
- Development of wind–resistant construction techniques
- Introducing improved construction techniques to the building industry and general public
- Modifying and strengthening existing structures
- Development of incentives to remove unsafe buildings and buildings on unsafe sites or to upgrade their level of safety
- Development of incentives to encourage future development on safer sites and safer methods of construction, such as favorable taxation, loans, or subsidies to qualifying building methods or sites
- Diversification of agricultural production—identification and planting of flood–resistant crops or adjustment of planting season, if possible, to avoid coinciding with cyclone and flood season
- Development of family savings programs to establish cash reserves
- Identification and strengthening of local organizations that serve as coping mechanisms
- Reforestation and range management to increase absorption of rainfall and reduce rapid runoff in mountainous areas

## **Preparedness Activities**

Preparedness activities include:

- Developing a disaster preparedness plan to sequence the activities and responsibilities of each participant;
- Developing warning and evacuation procedures for people threatened by floods;
- Training in first aid and trauma care and maintaining stocks of necessary medical supplies; and
- Establishing an emergency communication system regarding evacuation, health, safety, and security.

## Post–Disaster and Emergency Activities

Initial response by local authorities after a cyclone includes:

- Evacuation
- Search and rescue
- Medical assistance
- Disaster assessment
- Provision of short–term food and water
- Water purification
- Epidemiological surveillance
- Provision of temporary lodging.

Initial response by foreign aid organizations includes:

- Financial assistance
- Assistance in reopening roads
- Reestablishing communications contact with remote areas
- Disaster assessment
- Assistance with water purification.

Secondary response by local authorities after a cyclone includes:

- Repair and/or reconstruction of infrastructure, housing, and public buildings
- Creation of jobs
- Assistance to agricultural recovery (loans, seeds, farm equipment, animals), small businesses, fishermen, etc.

Secondary response by foreign agencies includes:

- Repair and/or reconstruction of housing
- Creation of jobs
- Credit
- Technical assistance
- Assistance to recovery of agriculture, small business, and institutions.

## References for Cyclones

Federal Emergency Management Agency website ([www.fema.gov](http://www.fema.gov)). “FEMA Preparedness.” Washington, DC: FEMA, 2000.

Peace Corps. Materials from the Mombasa Disaster and Development Conference. Washington, DC: Peace Corps, 1983.

## Volcanoes

A volcano is a mountain that opens downward to a reservoir of molten rock below the surface of the earth. Unlike most mountains, which are pushed up from below, volcanoes are built up by an accumulation of their own eruptive products: lava, ashflows, and airborne ash and dust. When pressure from gases and the molten rock becomes strong enough to cause an explosion, eruptions occur. Gases and rock shoot up through the opening and spill over the top or fill the air with ash and lava fragments. The danger area around a volcano typically covers a 20–mile radius, but some danger may exist 100 miles or more from a volcano. Volcanic products are used as building or road–building materials, as abrasive and cleaning agents, and as raw materials for many chemical and industrial uses. Lava ash makes soil rich in mineral nutrients.

### Primary Effects of Volcanoes

Three primary effects from volcanoes have been noted.

1. Volcanic ash can affect people hundreds of miles away from the cone of a volcano, making it difficult or impossible to breathe, contaminating water supplies, causing electrical storms, and collapsing roofs. Several of the deaths from the 1980 Mount St. Helens volcano located in the Cascade Range of southwestern Washington state in the United States were attributed to inhalation of ash. The 1992 Mount Pinatubo eruption in the Philippines caused 342 deaths and an evacuation of more than a quarter of a million people.
2. An erupting volcano can trigger tsunamis, flash floods, earthquakes, rockfalls, and mudflows.
3. Sideways–directed volcanic explosions, known as lateral blasts, can shoot large pieces of rock at very high speeds for several miles. These explosions can kill by impact, burial, or heat. They have been known to knock down entire forests. The majority of deaths attributed to the Mount St. Helens volcano resulted from lateral blasts and tree blow–down.

### Pre–Disaster Activities

It is important to provide information to the community about volcanoes. Here are some suggestions for ways to accomplish this:

- In a volcano–prone area, provide local emergency information about what to do and where to go in the event of a volcano.
- Bring in an expert to talk with community members about determining the likelihood of a volcanic eruption.
- Conduct a program and train others on how to recognize the warning signals of a possible volcanic eruption.
- Work with local emergency services and officials to prepare special information for people with mobility impairments (disabilities, children) on what to do if an evacuation is ordered.

## Preparedness Activities

Preparedness activities include:

- Develop and inform the public about community warning systems.
- Be prepared for the disasters that can be spawned by volcanoes:
  - Earthquakes
  - Flash floods
  - Landslides and mudflows
  - Thunderstorms
  - Tsunamis
- Develop evacuation plans. It is important to get to high ground away from the eruption. A primary route and a backup route should be planned.
- Develop an emergency communication plan. In case family members are separated from one another during a volcanic eruption, a plan should be made for getting back together.
- Ask an out-of-area relative or friend to serve as the “family contact,” and ensure that everyone knows the contact information of the person.
- Have disaster supplies on hand. These might include:
  - Flashlight and extra batteries
  - Portable, battery-operated radio and extra batteries
  - First aid kit and manual
  - Emergency food and water
  - Non-electric can opener
  - Essential medicines
  - Money
  - Sturdy shoes
  - Goggles and a throw-away breathing mask for each member of the household

## During and Post–Disaster Emergency Activities

Although it may seem safe to stay at home and wait out an eruption, this may be very dangerous. The rock debris from a volcano can break windows and set buildings on fire. Additionally, mudflows are a possible risk during a volcano. Mudflows are powerful rivers of mud that can move faster than people can walk or run. They occur when rain falls through ash-carrying clouds or when rivers are dammed during an eruption. Mudflows are most dangerous close to stream channels. When you approach a bridge, first look upstream. If a mudflow is approaching or moving beneath the bridge, do not cross it. The power of the mudflow can destroy a bridge very quickly. People should follow authorities’ instructions and leave the area before any part of the disaster begins. During the eruption, people should:

- Follow the evacuation orders issued by authorities.
- Avoid areas downwind of the volcano.
- If caught indoors:
  - Close all windows, doors, and dampers.

- Put all machinery inside a garage or barn.
- Bring animals and livestock into closed shelters.
- If trapped outdoors:
  - Seek shelter indoors.
  - If caught in a rockfall, roll into a ball to protect the head.
  - Avoid low–lying area where poisonous gases can collect and flash floods can occur.
  - If caught near a stream, beware of mudflows.
- Protect themselves
  - Wear long–sleeved shirts and pants to avoid irritation or burns.
  - Use goggles to protect eyes.
  - Avoid contact with ash, and, to the extent possible, stay indoors until local health officials advise that it is safe to go outside. Use a dust–mask or hold a damp cloth over the face to help breathing.
  - Turn car or truck engines off and avoid driving in heavy ashfall. Driving stirs up more ash that can clog engines and stall vehicles.
  - Clear roofs of ashfall when the eruption is over. Ashfall is very heavy and can cause buildings to collapse.
- Stay out of the area. A lateral blast of a volcano can travel many miles from the mountain. Trying to watch an erupting volcano is a deadly idea.
- Help neighbors who may require special assistance—those with infants or small children, elderly people, and people with disabilities.

## **Response of Authorities**

Initial response by local authorities after a volcano includes:

- Evacuation
- Search and rescue
- Medical assistance
- Disaster assessment
- Provision of short–term food and water
- Water purification
- Epidemiological surveillance
- Provision of temporary lodging

Initial response by foreign aid organizations includes:

- Financial assistance
- Reestablishing communications contact with remote areas
- Disaster assessment
- Assistance with water purification

Secondary response by local authorities after a volcano includes:

- Repair and/or reconstruction of infrastructure, housing, and public buildings, and/or relocation
- Creation of jobs
- Assistance to agricultural recovery (loans, seeds, farm equipment, animals), small businesses, fishermen, etc.

Secondary response by foreign agencies includes:

- Construction of housing
- Creation of jobs
- Credit
- Technical assistance
- Assistance to recovery of agriculture, small business, and institutions

## **Lessons Learned**

The following are lessons learned.

- Outbreaks of cholera do not follow volcanoes. Cholera must be endemic to a community beforehand.
- Waterborne diseases do not increase as a result of volcanoes.
- Extensive food aid is rarely required after a volcano.
- Used clothing is almost never needed, is usually culturally inappropriate and, although accepted by many disaster victims, is almost never worn.
- Blankets can be useful but can usually be found locally and do not need to be imported.
- Assistance by outsiders is most effective in the reconstruction period, not the emergency phase.
- Most needs are met by the victims themselves or their local governments.
- In general, victims do not respond to disasters with abnormal behavior. Volcanoes do not incite panic, hysteria, or rioting.
- Volcano relief and reconstruction programs should be integrated with long-term development programs.

## **References for Volcanoes**

Federal Emergency Management Agency website ([www.fema.gov](http://www.fema.gov)). “FEMA Preparedness.” Washington, DC: FEMA, 2000.

## *Floods*

Floods caused by overflowing rivers result from precipitation over large areas or from the melting of the winter’s accumulation of snow, or from both. These riverine floods differ from flash floods in their extent and duration. Flash floods are of short duration in small streams, while riverine floods take place in river systems whose tributaries may drain large geographic areas and encompass many independent river basins. Floods on large river systems may continue for periods ranging from a few hours to many days. Flood flows in large river systems are influenced primarily by variations in the intensity, amount, and distribution of precipitation. The condition of the ground—amount of soil moisture, seasonal variations in vegetation, depth of snow cover, and imperviousness due to urbanization—directly affects runoff.

### **Primary Effects of Floods**

Floods are natural hazards that are not, in and of themselves, disasters, but they can transform a vulnerable situation into a disaster. The vulnerability of a human settlement is determined by its exposure to flooding. Siting, soil conditions, absorptive capacity of the watershed, and the capacity of streams to carry runoff all have an effect on the extent of the flooding. Urban and rural communities sited on floodplains of rivers or streams are most at risk. Deaths usually exceed injuries, with surgical needs tending to be low and occurring during the first 72 hours in most cases. However, floods can bring an immediate threat of waterborne diseases and create conditions that promote secondary threats of water- and vector-borne diseases.

The most important determinant of vulnerability is the level of poverty and underdevelopment of a particular group. Poor people usually suffer most in disasters because they often live in weaker houses located in the most undesirable and most vulnerable areas. Furthermore, dramatic increases in population size, distribution, and density increase disaster risk. Urban slums and squatter settlements grow at about twice the average urban rate. Land tenure is also a determinant of vulnerability, especially where there is a scarcity of arable or developed land and poor farmers must engage in agriculture on hazardous land.

Floods can kill people. The number of deaths is significantly higher in developing countries where communications are poor and warning systems and evacuation plans are inadequate. Furthermore, it is expected that the number of deaths will increase as population pressures force people into more vulnerable areas such as low-lying agricultural areas or overcrowded urban slums on floodplains.

Floods can also damage human settlements, force evacuations, damage crops (especially tubers), damage food stocks, strip farmland, wash away irrigation systems, erode or render unusable large areas of land, and change the course of streams and rivers. Floods can also have a beneficial effect by depositing silt in some downstream areas.

### **Secondary Effects of Floods**

A secondary effect of heavy rain and flooding is mudslides, which are caused by supersaturating deforested or stripped hillsides. Significant loss of life can occur in massive mudslides resulting from the torrential rains, especially in squatter settlements located in floodplains.

## Lessons Learned

The following are lessons learned.

- Outbreaks of cholera do not follow floods. Cholera must be endemic to a community beforehand.
- Massive food aid is rarely required after a flood, although food distribution systems may need to be set up immediately after a flood in the affected area.
- Used clothing is almost never needed, is usually culturally inappropriate and, though accepted by disaster victims, is almost never worn.
- Blankets can be useful but can usually be found locally and do not need to be imported.
- Flood mitigation and reconstruction programs must be integrated with long-term development programs.
- Reconstruction assistance in agriculture can provide a strong stimulus to recovery and a base for positive changes.
- Reconstruction programs should seek to reduce the vulnerability of communities.
- Reestablishment of the local agriculture, economy, and job security is more important to flood victims than material assistance.
- Waterborne diseases do not increase as a result of floods.
- Assistance by outsiders is most effective in the reconstruction period, not the emergency phase.
- Most needs are met by the victims themselves or their local governments.
- In general, victims do not respond to disasters with abnormal behavior. Floods do not incite panic, hysteria, or rioting.

## Pre–Disaster Activities

The majority of the deaths and destruction created by floods are preventable. It is important to note that the public and those supporting them, such as engineers, planners, and politicians, need to understand the nature of the hazard so that decisions and commitments can be made to implement mitigation measures to reduce flood damage. Reducing the harmful effects of flood requires actions on three fronts:

1. Reducing the vulnerability of the physical settlements and structures in which people live;
2. Reducing the vulnerability of the economy; and
3. Strengthening the social structure of a community so that coping mechanisms can help absorb the impact of the disaster and promote rapid recovery.

The first step in reducing vulnerability for human settlements is to identify the high-risk areas. This is done by relating the effects of the flood to the terrain and to the probability that such an event will occur. This activity is addressed through mapping the community. Flood risk mapping would indicate the areas likely to be covered by water during floods of given magnitude. The second step in vulnerability reduction is to identify the communities that are particularly

susceptible to damage or destruction, particularly poor communities. Reduction of vulnerability may also involve:

- Development of extensive public awareness programs to inform the public about the hazards and illustrate what can be done to prevent a disaster
- Land–use zoning to control development
- Construction of protective works, such as embankments, to protect from flooding
- Restrictive development regulations to ensure that any development meets certain standards that take into consideration the threat to the site
- Land swaps, which would provide alternatives to development of the site
- Imposition of design criteria or building standards to govern construction
- Development of flood–resistant construction techniques
- Conducting a program for building industry workers and the general public to introduce improved construction techniques
- Modifying and strengthening existing structures
- Constructing raised areas or buildings specified as refuges if evacuation is impossible
- Development of incentives to remove unsafe buildings and buildings on unsafe sites or to upgrade their level of safety
- Development of incentives to encourage future development on safer sites and safer methods of construction, such as favorable taxation, loans, or subsidies to qualifying building methods or sites
- Diversification of agricultural production—identification and planting of flood–resistant crops or adjusting planting season when possible to avoid coinciding with the flood season
- Establishment of cash and food reserves
- Development of family savings programs to establish cash reserves
- Identifying and strengthening local organizations that serve as coping mechanisms
- Reforestation and range management to increase absorption and to reduce rapid runoff in mountainous areas

## **Preparedness Activities**

Preparedness activities include:

- Developing a disaster preparedness plan to sequence the activities and responsibilities of each participant
- Developing warning and evacuation procedures for people threatened by floods
- Training for first aid and trauma and maintaining stocks of medical supplies
- Establishing an emergency communication system regarding evacuation, health, safety, and security
- Reviewing the location of critical facilities such as hospitals, government buildings, communications installations, and other structures

## Post–Disaster and Emergency Activities

Initial response by local authorities after a flood includes:

- Evacuation
- Search and rescue
- Medical assistance
- Disaster assessment
- Provision of short–term food and water
- Water purification
- Epidemiological surveillance
- Provision of temporary lodging

Initial response by foreign aid organizations includes:

- Financial assistance
- Assistance in reopening roads
- Reestablishing communications contact with remote areas
- Disaster assessment
- Assistance with water purification

Secondary response by local authorities after a flood includes:

- Repair and/or reconstruction of infrastructure, housing, and public buildings
- Creation of jobs
- Assistance to agricultural recovery (loans, seeds, farm equipment, animals), small businesses, fishermen, etc.

Secondary response by foreign agencies includes:

- Repair and/or reconstruction of housing
- Creation of jobs
- Credit
- Technical assistance
- Assistance to recovery of agriculture, small business, and institutions

## References for Floods

Federal Emergency Management Agency website ([www.fema.gov](http://www.fema.gov)). “FEMA Preparedness.” Washington, DC: FEMA, 2000.

Hughes, R. “The Effects of Flooding upon Buildings in Developing Countries.” *Disasters* 6(3): 183–194, 1982.

Owen, J.H. *Equipment for Flood and Flash Flood Warning Systems*. Washington, DC: U.S. Department of Commerce, 1980.

Peace Corps. Materials from the Mombasa Disaster and Development Conference. Washington, DC: Peace Corps, 1983.

Schware, R. *Flood Forecasting and Warning: The Social Value and Use of Information in West Bengal*. Geneva: United Nations Research Institute, 1981.

Schware, R. “Official and Folk Flood Warning Systems: An Assessment.” *Environmental Management* 6(3): 209–216, 1982.

U.S. Water Resources Council. *Regulation of Flood Hazard Areas to Reduce Flood Losses*. Washington, DC: USWRC, 1972.

## *Hurricanes*

A hurricane is a type of tropical cyclone that occurs in the Northern Hemisphere and has winds that have reached a constant speed of 74 mph (119 kph) or more. They are products of the tropical ocean and the atmosphere. Powered by heat from the sea, they are steered erratically by easterly trade winds and temperate westerly winds, as well as by their own energy. While many hurricanes stay out at sea, many also move ashore. If they move ashore, they bring with them a storm surge of ocean water along the coastline, high winds, tornadoes, torrential rains, and flooding.

Hurricane winds blow in a large spiral around a relatively calm center known as the “eye.” The eye is generally 20 to 30 miles (32 to 48 kilometers [km]) wide, and the storm may extend outward 400 miles (645 km). As a hurricane approaches, the skies begin to darken and winds grow in strength. A single hurricane can last for more than two weeks over open waters and can cut a path hundreds of miles long.

### **Primary and Secondary Effects of Hurricanes**

Disasters from hurricanes occur when the human settlements are vulnerable. Vulnerability is determined by the exposure to the storms, the degree to which the houses and other structures can be damaged, and the likelihood that secondary effects could occur. Secondary effects can include flash floods and a storm surge, a large dome of water often 50 to 100 miles (80 to 160 km) wide that arrives up to five hours before the storm and sweeps across the coastline near where a hurricane makes landfall. Along the immediate coast, a storm surge is the greatest threat to life and property, even more so than high winds. Urban and rural communities in unprotected, low-lying coastal areas exposed to hurricanes, or on river floodplains, are considered vulnerable to hurricanes. The possibility of people drowning is a major concern because of sudden flash flooding. Poverty and underdevelopment are key factors determining vulnerability given the structural weakness of the homes and the higher probability for living in exposed locations.

Hurricanes can cost millions, and sometimes billions, of dollars in damages. During a hurricane, homes, businesses, public buildings, and infrastructure may be damaged or destroyed by high winds and high waves. Debris can break windows and doors, allowing high winds and rain inside homes. Roads and bridges can be washed away by flash flooding, or can be blocked by debris. In extreme storms, the force of the wind alone can cause tremendous devastation, as trees and power lines topple and weak elements of homes and buildings fail. Losses are not limited to the coastline: under the right conditions they can extend hundreds of miles inland. There also may be damage to agricultural land, crops, and foodstuffs.

There are a variety of measures that can be taken—both at the individual and community levels—to reduce vulnerability to hurricane hazards. Simple construction measures, such as the use of storm shutters over exposed glass, and the addition of hurricane straps to hold the roof of a structure to its walls and foundation, have proven highly effective in reducing damage from hurricanes. In addition, more complex mitigation measures can be pursued to further reduce a property’s susceptibility. For example, coastal homes and businesses can be elevated to permit coastal storm surges to pass under living and working spaces. Communities can further reduce their vulnerability to hurricanes through the adoption and enforcement of wind- and flood-

resistant building codes. Sound land–use planning can also ensure that structures are not built in the highest hazard areas.

## Pre–Disaster Activities

Reducing the harmful effects of a hurricane requires actions on three fronts:

1. Reducing the vulnerability of physical settlements and residential structures;
2. Reducing the vulnerability of the economy; and
3. Strengthening the social structure of a community so that coping mechanisms can help absorb the impact of the disaster and promote rapid recovery.

The first step in reducing vulnerability for human settlements is to identify the high–risk areas. This is done by relating the effects of the hurricane to the terrain and to the probability that a hurricane will occur. This activity is addressed through mapping the community. The second step in vulnerability reduction is to identify those communities that are particularly susceptible to damage or destruction, particularly poor communities. Reduction of vulnerability may also involve:

- Development of extensive public awareness programs to inform the public about the hazards and illustrate what can be done to prevent a disaster
- Land–use zoning to control development
- Construction of protective works, such as embankments, to protect from flooding
- Restrictive development regulations to ensure that any development meets standards that consider the threat to the site
- Land swaps, which would provide alternatives to development of the site
- Imposition of design criteria or building standards to govern construction
- Development of construction techniques that are resistant to hurricane conditions
- Introducing improved construction techniques to the building industry and general public
- Modifying and/or strengthening existing structures
- Development of incentives to remove unsafe buildings and buildings on unsafe sites or to upgrade their level of safety
- Development of incentives to encourage future development on safer sites and safer methods of construction, such as favorable taxation, loans, or subsidies to qualifying building methods or sites
- Diversification of agricultural production—identification and planting of flood–resistant crops or adjustment of planting season, if possible, to avoid coinciding with hurricane and flood season
- Development of family savings programs to establish cash reserves
- Identification and strengthening of local organizations that serve as coping mechanisms
- Reforestation and range management to increase absorption and reduce rapid runoff in mountainous areas

## Preparedness Activities

Preparedness activities include:

- Developing a disaster preparedness plan to sequence the activities and responsibilities of each participant
- Developing warning and evacuation procedures, including safe evacuation routes and shelters for people threatened by hurricanes, floods, and the destructive hazards that they can cause
- Training in first aid and trauma care and maintaining stocks of medical supplies
- Establishing an emergency communication systems regarding evacuation, health, safety, and security
- Ensuring that disaster supplies are on hand, such as
  - Flashlight and extra batteries
  - Portable, battery–operated radio and extra batteries
  - First aid kit and manual
  - Emergency food and water
  - Nonelectric can opener
  - Essential medical supplies/medicines
  - Money
  - Sturdy shoes
- Additional preparedness activities:
  - Teaching family members how to deal with any in–house utilities in the case of an emergency
  - Protecting the windows of the home or business from high winds or and debris
  - Trimming back dead or weak trees or branches near a home or business
  - Identifying a meeting place in case family members are separated
  - Knowing and sharing contact information

## During a Hurricane Watch

There are a number of activities to take part in during a hurricane watch:

- Listen to the radio for hurricane progress reports
- Check emergency supplies
- Make sure that cars and other vehicles, such as motorcycles have gas
- Bring in outdoor objects and anchor those that cannot be brought inside
- Secure buildings by closing and boarding up windows
- Store perishable food if possible
- Store drinking water in clean containers
- Review evacuation plan
- Moor or move boats to designated safe places; use ropes or chains to secure boats

## During a Hurricane Warning

There are a number of activities in which to take part during a hurricane warning:

- Listen to a battery–operated radio for storm–related instructions.
- If you are in an unsafe building, evacuate it immediately.
- Store valuables and personal papers in a waterproof container on the highest level of the home or business.
- Avoid elevators.
- If you are at home:
  - Stay inside, away from windows, skylights, and glass doors.
  - Keep a supply of flashlights and extra batteries handy. Avoid open flames, such as candles, as a source of light.
  - If power is lost, turn off major appliances to reduce a power surge when electricity is restored.
- If officials indicate evacuation is necessary:
  - Leave as soon as possible. Avoid flooded roads and watch for washed–out bridges.
  - Protect the home from electrical accidents by unplugging appliances and, if possible, turning off the electricity and the main water valve.
  - If possible, tell someone outside of the storm area where you are going.
  - If time permits, and you live in an identified surge zone, elevate furniture to protect it from flooding or move it to a higher floor.
  - Bring pre–assembled emergency supplies, warm protective clothing, blankets, and sleeping bags with you.
  - Lock the house and leave.

## After a Hurricane

- Stay tuned to local radio for information.
- Help injured or trapped persons.
  - Give first aid where appropriate.
  - Do not move seriously injured persons unless they are in immediate danger of further injury.
- Call for help.
- Return home only after authorities advise that it is safe to do so.
  - Avoid loose or dangling power lines and report them immediately to the appropriate authorities.
  - Enter your home with caution.
  - Beware of snakes, insects, and animals driven to higher ground by flood water.
  - Open windows and doors to ventilate and dry your home.
  - Check refrigerated foods for spoilage.
  - Drive only if absolutely necessary and avoid flooded roads and washed–out bridges.
  - If telephone is available, use it only for emergency calls.

- Inspect existing utilities in a damaged home
  - If there is gas heating or air conditioning, check for gas leaks—If there is a smell of gas or there is a blowing or hissing noise, open a window and quickly leave the building. Turn off the gas at the outside main valve if you can and call for help from a neighbor’s home. If gas is turned off for any reason, it must be turned back on by a professional.
  - Look for electrical system damage. If there are sparks, broken or frayed wires, or the smell of hot insulation, turn off the electricity if possible. *Do not step in water to get to a fuse box or circuit breaker. Call for help.*
  - Check for sewage and water line damage. If you suspect sewage lines are damaged, avoid using the toilets. If water pipes are damaged, contact appropriate authorities for help. Do not drink tap water. If there is ice in the refrigerator that was made before the disaster, melt it for drinking water.

## Post–Disaster/Emergency Activities

Initial response by local authorities after a hurricane includes:

- Evacuation
- Search and rescue
- Medical assistance
- Disaster assessment
- Provision of short–term food and water
- Water purification
- Epidemiological surveillance
- Provision of temporary lodging

Initial response by foreign aid organizations includes:

- Financial assistance
- Assistance in reopening roads
- Reestablishing communications contact with remote areas
- Disaster assessment
- Assistance with water purification

Secondary response by local authorities after a hurricane includes:

- Repair and/or reconstruction of infrastructure, housing, and public buildings
- Creation of jobs
- Assistance to agricultural recovery (loans, seeds, farm equipment, animals), small businesses, fishermen, etc.

Secondary response by foreign agencies includes:

- Repair and/or reconstruction of housing

- Creation of jobs
- Credit
- Technical assistance
- Assistance to recovery of agriculture, small business and institutions

## **Lessons Learned**

The following are lessons learned.

- Outbreaks of cholera do not follow hurricanes. Cholera must be endemic to a community beforehand.
- Waterborne diseases do not increase as a result of hurricanes.
- Extensive food aid is rarely required after a hurricane.
- Used clothing is almost never needed, is usually culturally inappropriate and, although accepted by many disaster victims, is almost never worn.
- Blankets can be useful but can usually be found locally and do not need to be imported.
- Assistance by outsiders is most effective in the reconstruction period, not the emergency phase.
- Most needs are met by the victims themselves or their local governments.
- In general, victims do not respond to disasters with abnormal behavior. Hurricanes do not incite panic, hysteria, or rioting.
- Hurricane relief and reconstruction programs should be integrated with long–term development programs.

## **References for Hurricanes**

Federal Emergency Management Agency website ([www.fema.gov](http://www.fema.gov)). “FEMA Preparedness.” Washington, DC: FEMA, 2000.

Peace Corps. Materials from the Mombasa Disaster and Development Conference. Washington, DC: Peace Corps, 1983.

## *Drought*

Operational definitions help define the onset, severity, and end of droughts. Research by Donald A. Wilhite, Director of the National Drought Mitigation Center, and Michael H. Glantz, of the National Center for Atmospheric Research, in the early 1980s uncovered more than 150 published definitions of drought. The definitions reflect differences in regions, needs, and disciplinary approaches. Wilhite and Glantz categorized their collection of definitions into four basic approaches to measuring drought: meteorological, hydrological, agricultural, and socioeconomic. The first three approaches deal with ways to measure drought as a physical phenomenon. The last deals with drought in terms of supply and demand, tracking the effects of water shortfall as it ripples through socioeconomic systems.

- **Meteorological drought** is usually an expression of precipitation’s departure from normal over some period of time. Meteorological measurements are the first indicators of drought. These definitions are usually region–specific, and presumably reflect a thorough understanding of regional climatology. The variety of meteorologic definitions from different countries at different times illustrates why it is important not to apply a definition of drought developed in one part of the world to another:
  - United States (1942): less than 2.5 mm of rainfall in 48 hours.
  - Great Britain (1936): 15 consecutive days with daily precipitation totals of less than .25 mm.
  - Libya (1964): when annual rainfall is less than 180 mm
  - India (1960): actual seasonal rainfall deficient by more than twice the mean deviation
  - Bali (1964): a period of six days without rain.
- **Agricultural drought** occurs when there is not enough soil moisture to meet the needs of a particular crop at a particular time. Agricultural drought occurs after meteorological drought but before hydrological drought. Agriculture is usually the first economic sector to be affected by drought.
- **Hydrological drought** refers to deficiencies in surface and subsurface water supplies. It is measured as stream flow and as lake, reservoir, and groundwater levels. There is a time lag between lack of rain and lack of water in streams, rivers, lakes, and reservoirs, so hydrological measurements are not the earliest indicators of drought. When precipitation is reduced or deficient over an extended period of time, this shortage will be reflected in declining surface and subsurface water levels.
- **Socioeconomic drought** occurs when physical water shortages start to affect people, individually and collectively. In more abstract terms, most socioeconomic definitions of drought associate it with the supply and demand of an economic good. One could argue that a physical water shortage with no socioeconomic impacts is a policy success. (See below, the Primary Effects of Droughts.)

No single operational definition of drought works in all circumstances, and this is one reason why policymakers, resource planners and others have more trouble recognizing and planning for drought than for other natural disasters. Most drought planners now rely on mathematic indices to decide when to start implementing water conservation measures in response to drought.

## Primary and Secondary Effects of Drought

Drought produces a complex web of impacts that spans many sectors of the economy and reaches well beyond the area experiencing physical drought. (The effects of drought can be categorized as economic, environmental, or social. These can be substantial and are discussed in Appendix 2: *The Full Range of Effects of Drought*.) This complexity exists because water is integral to our ability to produce goods and provide services. Impacts are commonly referred to as direct or indirect. Reduced crop, rangeland, and forest productivity; increased fire hazard; reduced water levels; increased livestock and wildlife mortality rates; and damage to wildlife and fish habitat are a few examples of direct impacts. The consequences of these impacts produce indirect impacts. For example, a reduction in crop, rangeland, and forest productivity may result in reduced income for farmers and agribusiness, increased prices for food and timber, unemployment, reduced tax revenues because of reduced expenditures, increased crime, foreclosures on bank loans to farmers and businesses, migration, and disaster relief programs. Direct or primary impacts are usually biophysical. Conceptually speaking, the more removed the impact from the cause, the more complex the link to the cause. In fact, the web of impacts becomes so diffuse that it is often difficult to come up with financial estimates of damages.

Drought represents one of the most important natural triggers for malnutrition and famine, a significant and widespread problem in many parts of Africa and in other countries as well. Deaths resulting from famine are sometimes mistakenly attributed to drought rather than to other causes such as war or civil strife. Numerous early warning systems have been established in Africa to monitor a wide range of physical and social variables that signal a trend toward food insecurity. The Southern Africa Development Community (SADC), for example, monitors the regional crop and food situation and issues alerts during periods of impending crisis.

The most important determinant of vulnerability is the level of poverty and underdevelopment of a particular group. The poor suffer most in disasters because they usually live in vulnerable conditions and vulnerable areas; furthermore, dramatic increases in population size, distribution, and density increase disaster risk. Urban slums and squatter settlements grow at about twice the average urban rate. Land tenure is also a determinant of vulnerability, especially where there is a scarcity of arable or developed land and poor farmers must engage in agriculture on hazardous land.

## Pre–Disaster Planning and Activities

Planning is the key to drought mitigation. Effective resources management requires a coordinated effort to address the interrelated issues of water conservation and planning for drought. Measures must be considered to increase available water supplies and to improve the efficient use of those supplies, but the specific type of measures put into place must be a result of individual country realities and conditions. Appropriate measures will include structural and nonstructural actions, or a combination of both. A symbiotic relationship exists between water conservation and drought planning: By conserving existing water supplies through efficient management or by developing new water supplies, the potential effects of drought are reduced and mitigation needs are diminished. The issues outlined below should be taken into account in the development of drought mitigation:

- Public education and technical assistance are key in promoting water–use efficiencies.

- Effective measures to mitigate drought will likely involve water management and conservation programs that provide for more efficient and effective use of water and a series of staged drought preparedness contingency plans which are implemented in steps as drought conditions intensify.
- Water resource management under drought conditions may require the cooperation of a consortium of national, regional, and local interests.
- Actions must be responsive to needs in developing and implementing drought emergency and contingency plans.
- Assistance on various levels will be needed to coordinate water conservation programs, contingency plans for drought–induced water shortages, and voluntary water transfers.
- Effective water quantity and quality management requires consideration of both water supply and water demand.
- As water conservation efforts prove successful and water use changes, drought contingency plans will need to be revised.

Water conservation activities can be achieved through various actions that depend upon the particular country conditions. Overall, these actions include:

- Improving the accuracy of seasonal runoff and water supply forecasts
- Modifying project operations
- Improving water scheduling
- Providing onstream, offstream, and underground storage of excess water
- Instituting conjunctive use of surface and ground water
- Implementing water quality management and wastewater reuse
- Reducing water conveyance losses
- Reducing water consumption by changing the type of water application system or using a metered approach if possible
- Advancing water conservation and effective resources management through education and training programs

The value of contingency planning is that it offers the opportunity for all parties to reach agreement about the use of scarce water resources prior to the time of crisis brought about by a drought. Procedural and other considerations that would otherwise delay implementation of the plans should be addressed and resolved during the contingency planning process.

## **Post–Disaster/Emergency Activities**

Initial response by local authorities during a drought includes:

- Medical assistance
- Disaster assessment
- Food and water distribution
- Epidemiological surveillance

- Refugee assistance
- Conflict resolution

Initial response by foreign aid organizations includes:

- Food and water assistance
- Financial assistance
- Disaster assessment
- Refugee assistance

Secondary response by local authorities during a drought includes:

- Creation of jobs
- Assistance to agricultural recovery (loans, seeds, farm equipment, animals), small businesses, fishermen, etc., and
- Repatriation efforts.

Secondary response by foreign agencies includes:

- Creation of jobs
- Credit
- Technical assistance, and
- Assistance to recovery of agriculture, small businesses, and institutions.

## **Lessons Learned**

The following are lessons learned.

- Outbreaks of cholera do not follow droughts. Cholera must be endemic to a community beforehand.
- Waterborne diseases do not increase as a result of droughts.
- Extensive food aid is rarely required after a drought.
- Used clothing is almost never needed, is usually culturally inappropriate and, although accepted by many disaster victims, is almost never worn.
- Blankets can be useful but can usually be found locally and do not need to be imported.
- Assistance by outsiders is most effective in the reconstruction period, not the emergency phase.
- Most needs are met by the victims themselves or their local governments.
- In general, victims do not respond to disasters with abnormal behavior. Droughts do not incite panic, hysteria, or rioting.
- Drought relief and reconstruction programs should be integrated with long–term development programs.

## **References for Droughts**

National Drought Mitigation Center website ([www.enso.unl.edu/ndmc](http://www.enso.unl.edu/ndmc)).

National Drought Mitigation Center website ([www.enso.unl.edu/ndmc](http://www.enso.unl.edu/ndmc)). "The Reclamation States Drought Assistance Act of 1988." Lincoln, NE: NDMC, 1988.

Peace Corps. Materials from the Mombasa Disaster and Development Conference. Washington, DC: Peace Corps, 1983.

## *Appendix 2:*

### *The Full Range of Effects of Drought*

Many economic impacts of drought occur in agriculture and related sectors, including forestry and fisheries, because these sectors rely on surface and subsurface water supplies. In addition to obvious losses in yields in both crop and livestock production, drought is associated with increases in insect infestations, plant disease, and wind erosion. Droughts also reduce growth and bring increased problems with insects and diseases to forests. The incidence of forest and range fires increases substantially during extended droughts, which in turn places both human and wildlife populations at higher levels of risk.

Loss of income is another indicator used in assessing the impacts of drought because so many sectors are affected. Reduced income for farmers has a ripple effect. Retailers and others who provide goods and services to farmers face reduced business. This leads to unemployment, increased credit risk for financial institutions, capital shortfalls, and loss of tax revenue for local, state, and federal governments. Less discretionary income affects the recreation and tourism industries. Prices for food, energy, and other products increase as supplies are reduced. In some cases, local shortages of certain goods make it necessary to import these goods from outside the affected region. Reduced water supply impairs the navigability of rivers and results in increased transportation costs because products must be transported by rail or truck. Hydropower production may also be significantly curtailed.

Environmental losses result from damage to plant and animal species, wildlife habitat, and air and water quality; forest and range fires; degradation of landscape quality; loss of biodiversity; and soil erosion. Some of the effects are short–term and conditions quickly return to normal following the drought. Other environmental effects linger for some time and some may become permanent. Wildlife habitat, for example, may be degraded through the loss of wetlands, lakes, and vegetation. However, many species will eventually recover from this temporary aberration. The degradation of landscape quality, including increased soil erosion, may lead to a more permanent loss of biological productivity of the landscape. Although environmental losses are difficult to quantify, growing public awareness and concern for environmental quality have forced public officials to focus more attention and resources on these effects.

Social impacts mainly involve public safety, health, conflicts between water users, reduced quality of life, and inequities in the distribution of impacts and disaster relief. Many of the impacts specified as economic and environmental have social components as well. Population out–migration is a significant problem in many countries, often stimulated by greater availability of food and water elsewhere. Migration is usually to urban areas within the drought area or to regions outside it; migration may even be to adjacent countries, creating refugee problems. However, when the drought has abated, these persons seldom return home, depriving rural areas of valuable human resources necessary for economic development. For the urban area to which they have immigrated, they place ever–increasing pressure on the social infrastructure, possibly leading to greater poverty and social unrest. The drought–prone northeast region of Brazil, for example, had a net loss of nearly 5.5 million people between 1950 and 1980. Although not all of this population shift was directly attributable to drought, it was a primary factor for many in the

decision to relocate. This continues to be a significant problem in Brazil and other drought–prone countries.

Drought represents one of the most important natural triggers for malnutrition and famine, a significant and widespread problem in many parts of Africa and in other countries as well. Deaths resulting from famine are sometimes mistakenly attributed to drought rather than to underlying causes such as war or civil strife. Numerous early warning systems have been established in Africa to monitor a wide range of physical and social variables that signal a trend toward food insecurity. The Southern Africa Development Community (SADC), for example, monitors the crop and food situation in the region and issues alerts during periods of impending crisis.

## **Economic Impact**

- Loss from crop production
  - Annual and perennial crop losses
  - Damage to crop quality
  - Reduced productivity of cropland (wind erosion, etc.)
  - Insect infestation
  - Plant disease
  - Wildlife damage to crops
- Loss from dairy and livestock production
  - Reduced productivity of rangeland
  - Forced reduction of foundation stock
  - Closure/limitation of public lands to grazing
  - High cost/unavailability of water for livestock
  - High cost/unavailability of feed for livestock
  - High livestock mortality rates
  - Disruption of reproduction cycles (breeding delays or unfulfilled pregnancies)
  - Decreased stock weights
  - Increased predation
- Range fires
  - Loss from timber production
  - Wildland fires
  - Tree disease
  - Insect infestation
  - Impaired productivity of forest land
- Loss from fishery production
  - Damage to fish habitat
  - Loss of young fish due to decreased water flow
- Loss of national economic growth, retardation of economic development
- Income loss for farmers and others directly affected

- Loss of farmers through bankruptcy
- Unemployment from drought–related production declines
- Loss to recreational and tourism industry
- Loss to manufacturers and sellers of recreational equipment
- Increased energy demand and reduced supply because of drought–related power curtailments
- Costs to energy industry and consumers associated with substituting more expensive fuels for hydroelectric power
- Loss to industries directly dependent on agricultural production, such as machinery and fertilizer manufacturers, food processors, etc.
- Decline in food production/disrupted food supply
  - Increase in food prices
  - Increased importation of food resulting in higher food costs
- Disruption of water supplies
- Revenues to water supply firms
  - Revenue shortfalls
  - Windfall profits
- Strain on financial institutions due to foreclosures, greater credit risks, capital shortfalls, etc.
- Revenue losses to federal, state, and local governments from reduced tax base
- Loss from impaired navigability of streams, rivers, and canals
- Cost of water transport or transfer
- Cost of development of new or supplemental water resources
- Cost of increased groundwater depletion (mining), land subsidence
- Decreased land prices

## **Environmental Impact**

- Damage to animal species
  - Reduction and degradation of fish and wildlife habitat
  - Lack of feed and drinking water
  - Disease
  - Increased vulnerability to predation due to species concentration near water
  - Migration and concentration, including loss of wildlife in some areas and too many wildlife in others
  - Increased stress to endangered species
- Damage to plant species
- Increased number and severity of fires
- Loss of wetlands
- Estuarine impacts and changes in salinity levels
- Increased groundwater depletion, land subsidence

- Loss of biodiversity
- Wind and water erosion of soils
- Reservoir, lake, and drawdown, including farm ponds
- Water quality effects, including salt concentration, increased water temperature, pH, dissolved oxygen, and turbidity
- Reduced flow from springs
- Air quality effects, such as dust, pollutants
- Visual and landscape quality

## **Social Impact**

- Food shortages resulting in decreased nutritional levels, malnutrition, famine
- Loss of human life due to food shortages, heat, suicides, and violence
- Public safety from forest and range fires
- Mental and physical stress, including anxiety, depression, loss of security, and domestic violence
- Health–related low–flow problems such as cross–connection contamination, diminished sewage flows, increased pollutant concentrations, reduced fire fighting capability, etc.
- Increased respiratory ailments
- Increased disease caused by wildlife concentrations
- Increased conflicts
  - Water user conflicts
  - Political conflicts
  - Management conflicts
  - Social unrest, civil conflicts
  - Other social conflicts such as scientific, media–based conflicts
- Disruption of cultural belief systems relating to religious and scientific views of natural hazards
- Reevaluation of social values, including priorities, needs, and rights
- Reduction or modification of recreational activities
- Public dissatisfaction with government regarding drought response
- Recognition of institutional restraints on water use
- Inequity in the distribution of drought relief
- Inequity in drought impacts based on:
  - Socioeconomic group
  - Ethnicity
  - Age
  - Gender
  - Seniority
- Loss of cultural sites

- Loss of aesthetic values
- Reduced quality of life, changes in lifestyle
  - in rural areas
  - in specific urban areas
  - increased poverty in general
- Population migrations from rural to urban areas and into other regions or countries
- Increased data/information needs, coordination of dissemination activities

### *Appendix 3:*

## *Case Study Examples of Peace Corps Volunteers' Involvement in Disaster Management*

The following are examples of case studies to provide background for how Peace Corps Volunteers have been involved in the past before, during, and after natural disasters. Information for the training should reflect the host country situation and involvement. Trainers should attempt to provide the relevant information from that country or similar environments. These situations were developed following Hurricanes Mitch (1998) and George (1998).

### *First–Year Hurricane Anniversary Report*

#### **Honduras**

Honduras suffered the main force of Hurricane Mitch in 1998 with widespread flooding, massive erosion, and landslides throughout the eastern and southern regions of the country. Homes, farms, businesses, and much of the country's infrastructure were destroyed. Volunteers are working to rebuild basic household and community infrastructure to allow families to meet immediate needs.

Since Hurricane Mitch, Peace Corps/Honduras has increased its Volunteer presence by over 40 percent. The Peace Corps is refocusing its programs in Honduras by integrating awareness and mitigation into all ongoing projects with a concentrated effort to train leaders, women, youth, and staff of organizations and municipalities to plan and prepare for future disasters. The Peace Corps is thus able to extend its reach, through its Peace Corps and Crisis Corps Volunteers, to large numbers of people and communities hardest hit by the hurricane. Projects in traditional Peace Corps sectors such as water and sanitation are now focusing on rebuilding water–system and latrine infrastructure destroyed by the hurricanes. Those in agriculture are helping the impoverished rural population recover from devastating crop loss in basic grains and providing income generation opportunities through the production of small livestock. Projects in new areas to Peace Corps, such as municipal management aim to train municipal staff to be the locus for rebuilding community infrastructure and services.

#### **Peace Corps Volunteer Activities**

**Morolica, Choluteca:** The entire community of Morolica where the Volunteer was assigned was swept away by massive river flooding caused by Hurricane Mitch, leaving behind only the remains of the local church. More than 400 homes were lost, including the Volunteer's. During the hurricane, the Volunteer worked with community leaders to evacuate townspeople to safety. In the days immediately following the hurricane, he and a schoolteacher walked almost 25 miles (40 kilometers) on wet, muddy roads to coordinate donations of emergency food and medical supplies from a neighboring community and carried the supplies to Morolica for distribution. He helped organize two temporary health centers which supplied emergency medical aid to hurricane victims and formed the community into several relief committees, such as food and clothing distribution, road rehabilitation, and census taking. He then established groups for latrine construction and helped with medical brigades, acting as a translator and liaison between

international aid agencies and local people. Following a temporary evacuation to Panama, the Volunteer returned to his site to continue the work with community leaders in the reconstruction efforts of “Nueva Morolica.” Because of his dedicated and tireless efforts before, during, and after Hurricane Mitch, he built an unbreakable bond between himself and the people of his community.

**San Antonio de Flores, Choluteca:** San Antonio de Flores, Choluteca, is a small community on the Pan American Highway south of Tegucigalpa. Torrential rains from Hurricane Mitch caused the Rio Grande, which flows by this community, to flood its banks, wreaking havoc on the community. Many people lost their homes and personal belongings. The Volunteer was a health extensionist whose primary assignment had been working to improve health practices in the community and develop youth leaders through life planning education. In the aftermath of Mitch, she worked with the town’s mayor to organize displaced persons into committees to determine needs and assisted them to secure building materials for temporary shelters through a local cooperative housing foundation with USAID funding. She supervised the local committees in the construction of 70 temporary shelters for 350 people. The townspeople in San Antonio de Flores are slowly piecing their lives back together. One year after Hurricane Mitch, the temporary shelters made of wood and plastic canvas still stand and continue to be a home for those families who lost everything during the storm. A fortunate few have established a small store within their one–room shelter where they sell candies, bags of banana chips, and cans of soda and have one or two small cots that accommodate a family of four to five people. Life on the Rio Grande along the Pan American Highway remains a struggle, but now with a roof over their heads these families are reconstructing other parts of their lives.

### **Crisis Corps Activities:**

In the last year, the Crisis Corps has placed 44 Volunteers in Honduras. They have worked with communities to rehabilitate water systems, build new housing, train unskilled workers in basic construction techniques, assist with immunization campaigns, provide trauma counseling, and work with farmers on mitigation techniques.

The 12 Crisis Corps Volunteers assigned to water and sanitation projects estimate that they have helped with the damage assessment, repair, or construction of well over 100 water systems. Five of the Volunteers are civil engineers; several took leaves of absence from their firms to respond to the devastation in Honduras. The group included a geologist who was a Peace Corps Volunteer in the Dominican Republic in the early 1970s. Now a university professor, he volunteered to work during his summer break with SANAA, the Honduran Ministry responsible for water projects. In addition to evaluating water supply sources and locating dozens of sites for future drilling, he also provided technical training to SANAA personnel and staff from NGOs working on water projects.

## Dominican Republic

In the Dominican Republic, Hurricane Georges caused widespread damage to infrastructure, homes, water systems, crops, and businesses, especially in the southern and eastern regions of the country. Peace Corps Volunteers serve in some of the most devastated areas of the country working in agriculture, education, environment, forestry, water and sanitation, child survival, and small business development. Immediately following Georges, Volunteers in all sectors, along with Crisis Corps Volunteers, worked in emergency response activities and have parlayed those experiences into ongoing mitigation and response efforts including promoting rapid–production crops, rebuilding of water systems, schools, and latrines, and housing reconstruction.

By incorporating disaster mitigation and preparedness into all project areas, the Peace Corps is able to extend its reach through its Peace Corps Volunteers and Crisis Corps Volunteers to large numbers of people and communities hardest hit by the hurricanes. A concentrated effort is being made to train leaders, women, youth, and staff of organizations and municipalities to plan and prepare for future disasters.

### Peace Corps Volunteer Activities

**Hato:** When Hurricane Georges destroyed more than half of the schools in her district, one Volunteer shifted her focus from developing teacher training modules to leading a school reconstruction program. She worked closely with eight communities in her province to rebuild their community schools, start school vegetable gardens, and initiate reforestation efforts.

**Brisas del Este:** One Volunteer was living in Brisas del Este in the outskirts of Santo Domingo when the hurricane hit the Dominican Republic. The 2,500–member community was severely damaged by Georges, and most houses were destroyed, including his. In response to the damage, he worked with a local NGO on a housing reconstruction project that benefited 25 families and helped to establish a temporary medical dispensary to provide first aid to the community. He also facilitated the procurement of two 500–gallon water tanks to provide chlorinated water to the community. As part of the project, he helped form and train a local community team to chlorinate the water and oversee its distribution. This project was said to have avoided an outbreak of waterborne disease due to the lack of potable water in the community.

### Crisis Corps Activities

Thirty–three Crisis Corps Volunteers have been sent to the Dominican Republic to help communities recover from Hurricane Georges. The Volunteers worked with the Red Cross, World Food Program, Habitat for Humanity and several Dominican NGOs to construct housing, monitor food distribution, rehabilitate agriculture, and repair latrines.

Five Crisis Corps Volunteers were assigned to Habitat for Humanity/Dominican Republic to help community members repair housing in Tamayo, a town which had been covered by a three–foot blanket of mud and debris. The Volunteers helped plan and implement a project that repaired more than 450 houses. Team members included two Peace Corps Volunteers who had served in the Dominican Republic in the early 1960s. One went on to a 25–year career at the U.S. Department of Housing and Urban Development, and the other is a teacher with seven years of construction management experience.

## Nicaragua

Nicaragua suffered widespread flooding and landslides from Hurricane Mitch, causing loss of infrastructure, as well as damage to homes, businesses, schools and crops. In response to immediate needs following Mitch, as well as long–term development needs in rural Nicaragua, the Peace Corps launched a new agriculture project to help the impoverished rural population recover from devastating crop loss in basic grains and to provide opportunities to generate income.

Peace Corps/Nicaragua is strengthening coordination with communities and municipalities to increase their capacity to plan, implement, and facilitate mitigation and recovery activities in such areas as latrine and water source development, health education, and soil conservation including reforestation, live barriers, and alley cropping. Throughout these activities, a special emphasis has been placed on youth development and participation.

Over the past year, 14 Crisis Corps Volunteers have worked in Nicaragua on construction projects, agriculture rehabilitation projects, and health activities with Nicaraguan NGOs as well as Project Concern, Save the Children, Catholic Relief Services, and Technoserve.

In the aftermath of Hurricane Mitch, Peace Corps Volunteers were instrumental in coordinating with church, governmental, and NGOs to get food, clothing, and water to individuals in designated refuge areas. Many Volunteers concentrated their efforts on contaminated water sources by working with local health center personnel and community leaders and going house to house visiting families, explaining the health hazards of contaminated water, and distributing bleach to purify drinking water.

### Peace Corps Volunteer Activities

**Estelí:** Before Hurricane Mitch, one Volunteer had begun working with a Mother’s Club promoting balanced diets for their children and had collaborated with Doctors Without Borders on a de–parasite and supplemental–nutrition campaign. He is now making house–to–house visits in seven villages on an anti–cholera campaign organized by Food for the Hungry. He believes the success of the work stems from their organization before the hurricane. Since Mitch, he has helped eight women leaders start a fruit–tree nursery as well as a 10,000–shade–tree nursery with the assistance of the Nicaraguan Agricultural Technical Assistance Institute (INTA). He also is assisting with efforts in the reconstruction of two bridges that were washed out by the storm.

**Palo Grande:** A Volunteer participated as a member of her town’s emergency action committee in Palo Grande, Chinandega. Safe drinking water was a major concern for the community, so she gave educational sessions on the importance of boiling water to purify it. She helped organize a brigade of health volunteers to go house to house and lead community meetings about preventing cholera, diarrhea, dengue, and malaria. She also helped distribute food aid to townspeople and to the 750 refugees sheltered in Palo Grande.

### Crisis Corps Activities

**Jinotega:** Two Crisis Corps Volunteers assigned to Project Concern worked with groups of farmers in Jinotega, an area hit hard by Mitch. One had previously served in Honduras, and the

other had served for three years in Paraguay, trained farmers in soil conservation and rehabilitation techniques and worked with families to plant community and family gardens.

## El Salvador

Although some areas of the country were gravely affected by Mitch, especially due to coastal flooding in the South, El Salvador escaped the severe, widespread damage seen in neighboring countries. Because the potential for future ecological disasters and hazards is still extremely high, Peace Corps/El Salvador’s programs in water and sanitation, agroforestry, and small business have placed a greater emphasis on disaster management and preparedness techniques throughout their projects.

Peace Corps/El Salvador has been bolstered by additional Volunteers who are working in municipal development to train municipal staff members and rural community groups to improve administration and organizations skills. Additionally, the Volunteers will provide permanent technical support to bridge the gap between the municipality and development agencies while supporting these agencies’ development and mitigation efforts.

By incorporating disaster mitigation and preparedness into all project areas, the Peace Corps is able to extend its reach, through its Peace Corps and Crisis Corps Volunteers, to large numbers of people and communities hardest hit by the hurricanes. A concentrated effort is being made to train leaders, women, youth, and staff of organizations and municipalities to plan and become prepared for future disasters.

### Peace Corps Volunteer Activities

**Berlin:** A volunteer who serves in Berlin, Usulután, and was on a bus traveling to her site when Hurricane Mitch struck. Leaving the bus, she walked to her site because the road was blocked by mudslides. She spent hours working her way around slides to reach her community. Once there, she immediately joined the mayor and town council in organizing relief efforts. She stayed in her site throughout the hurricane, assisting her friends and neighbors. She has extended her Peace Corps service for one year and is currently serving as the adviser to Berlin’s municipal council to develop a community disaster–preparedness plan.

**Pirraya:** A Volunteer is assigned to Pirraya, a small island inhabited by 100 families in the Gulf of Jiquilisco in the Department of Usulután. Life is hard in Pirraya, even under normal circumstances, but it was particularly difficult after Hurricane Mitch. All families were evacuated during the hurricane; returning families found that saltwater had intruded into the community’s precious drinking water sources. Since then, the Volunteer has worked with his neighbors to obtain funding for rehabilitating and improving the community’s access to safe drinking water. It appears likely that, through his efforts, a donor will build an innovative new water catchment basin in the island’s center, the only viable long–term solution to the community’s water problem.

### Crisis Corps Activities

Although El Salvador was not as badly affected by Hurricane Mitch as its neighbors, the country remains vulnerable to future hazards. A Salvadoran NGO working with coastal communities in Usulután requested a Crisis Corps Volunteer to work with them on a long–term plan to reduce the vulnerability of coastal areas to natural hazards. A former Peace Corps Volunteer from Colombia responded. Currently, he is a professor of architecture and community design at the University of

Iowa, he was able to put his experience in mitigation planning to good use in helping the Salvadoran organization think through the elements of a sustainable disaster management plan.

## Guatemala

Guatemala was fortunate, in comparison to its neighbors, to escape the severe impact of Hurricane Mitch but still is feeling the effects of destructive flooding and landslides. The Peace Corps program in Guatemala is using Crisis Corps Volunteers in partnership with Peace Corps Volunteers to develop disaster mitigation plans and activities, not only in response to Mitch, but also to address potential hazards such as earthquakes, volcanoes, drought, and hurricanes throughout Central America.

Peace Corps/Guatemala Volunteers work in community disaster awareness and preparedness, water and sanitation system reconstruction, reforestation, community infrastructure and management, watershed management, small business training for micro–enterprise development, sustainable small–scale agriculture, and household food security. By incorporating disaster mitigation and preparedness into all project areas, the Peace Corps is able to extend its reach, through its Peace Corps and Crisis Corps Volunteers, to large numbers of people and communities hardest hit by the hurricanes. A concentrated effort is being made to train leaders, women, youth, and staff of organizations and municipalities to plan and become prepared for future disasters.

### Peace Corps Volunteer Activities

**Los Amates Village:** In 1998 the Amates River rose several meters and overflowed its banks, destroying the homes of the 17 Pokoman families in the Los Amates Village, San Luis Jilotepeque. The devastation that the Volunteer witnessed 10 hours later was total and traumatic—some people lost not only their homes but also their corn and beans stored in metal silos, their furniture, and everything they owned. Fortunately, no lives were lost. In the storm’s aftermath, she, in partnership with the Los Amates Housing Committee, a local Guatemalan NGO, requested assistance from the mayor, and other local organizations helped to reconstruct the community. CARE, the mayor, the Cooperative El Recuerdo and FONAPAZ offered excellent support and financial assistance to help rebuild the village.

### Crisis Corps Activities

The Crisis Corps provided eight Volunteers to work in areas that suffered extensive damage from Hurricane Mitch. One team was assigned to the municipality of Rio Hondo to help rebuild bridges, repair drinking water systems, and conduct health education workshops. This was also an area where many varieties of fruit trees washed away overnight in the flooding that resulted from the hurricane. Recognizing the farmers’ need to replace lost income, the Crisis Corps Volunteers developed a papaya project to generate cash income in the meantime. To help ensure the sustainability of the Crisis Corps project, two Peace Corps Volunteers have been assigned to the area to work with farmers on marketing and production.

## Eastern Caribbean

### Crisis Corps Activities

When Hurricane Georges passed through the Eastern Caribbean, a number of homes on the island of Antigua were damaged or destroyed. At the request of Antigua’s National Office of Disaster Services, 10 Crisis Corps Volunteers worked with laborers from Antigua’s Defense Force and the Public Works Department to help rebuild the homes of the neediest hurricane victims. In addition to providing hands–on assistance, several Crisis Corps Volunteers also developed a two–day training program for 25 local workers in hurricane–resistant construction techniques and helped create a training manual for the Office of Disaster Services titled *Build It Strong*.

## Appendix 4:

### Resources and Reference Materials

American Red Cross. *Earthquake*. (Pamphlet.) Washington, DC: ARC, 1998.

American Red Cross. *Fire*. (Pamphlet.) Washington, DC: ARC, 1998.

American Red Cross. *Flood*. (Pamphlet.) Washington, DC: ARC, 1998.

American Red Cross. *Tornado*. (Pamphlet.) Washington, DC: ARC, 1998.

American Red Cross. *Winter Storm*. (Pamphlet.) Washington, DC: ARC, 1998.

American Red Cross. *Your Evacuation Plan: What To Do if a Disaster Threatens and You Need To Leave Home in a Hurry*. Washington, DC: ARC, April 1998.

American Red Cross. *Wildfire: Are You Prepared?* (Pamphlet.) Washington, DC: ARC, 1993.

American Red Cross and the International Federation of the Red Cross and Red Crescent website ([www.redcross.org](http://www.redcross.org)).

Anderson, M.B., and Woodrow, P.J. *Rising From the Ashes: Development Strategies in Times of Disaster*. Boulder, CO: Lynne Rienner Publishers, Inc., 1998. (ICE number CD056)

Caribbean Disaster Emergency Response Agency website ([www.cdera.gov](http://www.cdera.gov)), 2000.

Caribbean Disaster Emergency Response Agency website ([www.cdera.org](http://www.cdera.org)), July 2000. “Report from the Third Caribbean Conference on National Hazards,” Barbados, October 13–15, 1999.

Centers for Disease Control and Prevention website ([www.cdc.gov](http://www.cdc.gov)).

Community Disaster Awareness Education website ([www.redcross.org/disaster.safety](http://www.redcross.org/disaster.safety)).

Cuny, F. *Disasters and Development*. Oxford: Oxford University Press, 1983. (ICE number CD020)

Department of Regional Development and Environment, Executive Secretariat for Economic and Social Affairs. *Disasters, Planning, and Development: Managing Natural Hazards To Reduce Loss*. Washington, DC: Organization of American States, December 1990.

Emergency Preparedness Information Center website ([www.theepicenter.com](http://www.theepicenter.com)).

Federal Emergency Management Agency. *Emergency Management Institute Catalog*. Washington, DC: FEMA, 1999.

Federal Emergency Management Agency. “International Cooperation in Emergency Preparedness and Disaster Management.” Washington, DC: FEMA, June 1999.

Federal Emergency Management Agency, Tropical Storm Watch website ([www.fema.gov.trop.htm](http://www.fema.gov.trop.htm)).

Federal Emergency Management Agency website ([www.fema.gov](http://www.fema.gov)). “FEMA Preparedness.” Washington, DC: FEMA, 2000.

Federal Emergency Management Agency website ([www.fema.gov](http://www.fema.gov)). International Federation of the Red Cross and Red Crescent. “World Disasters Report Predicts a Decade of Super–Disaster.” Geneva, Switzerland: IFRCRC, June 24, 1999.

Federal Emergency Management Agency website ([www.fema.gov](http://www.fema.gov)). “Oregon Targets ‘Disaster Cycle’—Project Impact Up and Running—Salem.” Washington, DC: FEMA, July 29, 1998.

Hughes, R. “The Effects of Flooding upon Buildings in Developing Countries.” *Disasters* 6(3): 183–194, 1982.

Institute for Business and Home Safety ([www.ibhs.org](http://www.ibhs.org)). “Is Your Home Protected From Hurricane Disaster? —A Homeowner’s Guide to Hurricane Retrofit.” Boston, MA: Institute for Business and Home Safety, 1998.

InterAction. “Weaving Gender in Disaster and Refugee Assistance.” Washington, DC: InterAction, July 1998.

International Association of Volcanology and Chemistry of Earth’s Interior. *Reducing Volcanic Risk: Tavurur Volcano Erupts Near Rabaul Town in Papua New Guinea*. (Video.) Campbell, Australia: IAVCEI, 1997.

International Disaster Information Network website ([www.smamedia.wdnetwork.com/hri/idin/usa.html](http://www.smamedia.wdnetwork.com/hri/idin/usa.html)).

International organizations working in relief and emergency assistance—website ([www.relief.web](http://www.relief.web)).

Kjargaard, J.L. *Kilauea, Close-Up of an Active Volcano*. (Video.) Volcano, HI: Ka’Io Productions, 1994.

Krafft, M. *Understanding Volcanic Hazards: 1982 Eruption of a Galunggung Volcano From Tasikmalaya, Indonesia*. (Video.) Campbell, Australia: International Association of Volcanology and Chemistry of Earth’s Interior, 1995.

List of disaster resources on the Internet—website ([www.agctr.lsu.edu/eden/netresources.htm](http://www.agctr.lsu.edu/eden/netresources.htm)).

National Drought Mitigation Center website ([www.enso.unl.edu/ndmc](http://www.enso.unl.edu/ndmc)). “The Full Range of Effects of Drought (adjunct for section on Droughts).” Lincoln, NE: NDMC, 2000.

National Drought Mitigation Center website ([www.enso.unl.edu/ndmc](http://www.enso.unl.edu/ndmc)), May 2000.

National Drought Migration Center website ([www.enso.unl.edu/ndmc](http://www.enso.unl.edu/ndmc)). “The Reclamation States Drought Assistance Act of 1988.” Lincoln, NE: NDMC, 1988.

National Fire Protection Association website ([www.nfpa.org](http://www.nfpa.org)).

National Institutes of Health. “Disaster Work and Mental Health: Prevention and Control of Stress Among Workers.” Bethesda, MD: NIH, 1983.

National Safety Council and Lowe’s Home Safety Council website ([www.lowes.com](http://www.lowes.com)). “Top 20 for Home Safety.” Itasca, IL: NSC, 1998.

National Weather Service website ([www.nws.noaa.gov](http://www.nws.noaa.gov)).

Office of Volunteer Safety and Overseas Security, Peace Corps. Washington, DC.

Organization of American States website ([www.oas.org](http://www.oas.org)).

Owen, J.H. *Equipment for Flood and Flash Flood Warning Systems*. Washington, DC: U.S. Department of Commerce, 1980.

Pacific Disaster Center website ([www.pdc.org](http://www.pdc.org)).

Pan American Health Organization website ([www.paho.org](http://www.paho.org)).

Peace Corps. *Crisis Management Training Module*. Office of Special Services: Peace Corps/Washington, 1997. (May be available through Medical Office).

Peace Corps. *Evacuation Support Guide: A Guide for Peace Corps Staff*. Washington, DC: Peace Corps, January 2000.

Peace Corps. *Participatory Analysis for Community Action*. Washington, DC: Peace Corps, 1996. (ICE number M0053)

Peace Corps. Materials from the Mombasa Disaster and Development Conference. Washington, DC: Peace Corps, 1983.

Peace Corps. “Psychosocial Issues in Disasters.” Washington, DC: Peace Corps, 1983.

Post Emergency Action plan. Peace Corps. (Post–specific—see your country director)

Prevention, Mitigation, Preparedness, and Planning Division. *Mitigation Practitioner’s Handbook*. Washington, DC: U.S. Agency for International Development, Bureau for Humanitarian Response, Office of Foreign Disaster Assistance, October 1998.

Sancio, R.T. “Disaster in Venezuela: The floods and landslides of December 1999.” *Natural Hazards Observer*. (Newsletter.) Vol. XXIV, No. 4. Boulder, CO: University of Colorado, Natural Hazards Center, 2000.

Schware, R. “Official and Folk Flood Warning Systems: An Assessment.” *Environmental Management* 6(3): 209–216, 1982.

Schware, R. *Flood Forecasting and Warning: The Social Value and Use of Information in West Bengal*. Geneva, Switzerland: United Nations Research Institute, 1981.

United Nations Disaster Relief Office. *Shelter After Disaster*. New York: UN, 1982.

United Nations High Commission for Refugees website ([www.unhcr.ch](http://www.unhcr.ch)).

U.S. Agency for International Development, Office of Foreign Disaster Assistance website ([www.info.usaid.gov/hum\\_response/ofda](http://www.info.usaid.gov/hum_response/ofda)), 2000. United Nations. “Disasters: A Deadly and Costly Toll Around the World.” New York: UN, 1997.

U.S. Agency for International Development, Office of Foreign Disaster Assistance website ([www.info.usaid.gov/hum\\_response/ofda](http://www.info.usaid.gov/hum_response/ofda)).

U.S. Geological Survey. *Implications for Earthquake Risk Reduction in the United States From the Kocaeli, Turkey, Earthquake of August 17, 1999*. Circular 1193. Washington, DC: U.S. Department of the Interior, January 2000.

U.S. Geological Survey. Center for Integration of Natural Disaster Information. FS 98–166. Washington, DC: U.S. Department of the Interior, December 1998.

U.S. Geological Survey. “The U.S. Geological Survey Recent Highlights—Hazards.” FS 96–248. Washington, DC: U.S. Department of the Interior, December 1997. pp. 188–197.

U.S. Geological Survey. *Perilous Beauty, Hidden Dangers of Mount Rainier*. (Video.) Washington, DC: U.S. Department of the Interior, 1996.

U.S. Geological Survey. *Hurricane Force: A Coastal Perspective*. (Video.) Washington, DC: U.S. Department of the Interior, 1994.

U.S. Geological Survey website ([www.usgs.gov](http://www.usgs.gov)).

U.S. Water Resources Council. *Regulation of Flood Hazard Areas to Reduce Flood Losses*. Washington, DC: USWRC, 1972.