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Integrated Emergency Management System

HAZARDS ANALYSIS FOR EMERGENCY MANAGEMENT (INTERIM GUIDANCE)

September 1983

Federal Emergency Management Agency

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FEDERAL EMERGENCY MANAGEMENT AGENCY

FOREWORD

Fiscal Year 1984 marks the initial implementation of the Integrated Emergency Management System (IEMS) at all levels of government nationwide. The material provided by the Federal Emergency Management Agency (FEMA) to support this implementation has been labeled INTERIM GUIDANCE. The word interim should not be interpreted to mean tentative. FEMA is totally committed to the concept and direction exemplified by the IEMS process.

To be effective, IEMS must be your system as well as FEMA's system. It must meet your needs as well as it meets our needs. Your comments and suggestions will be an important factor in making future refinements to the process and in revising the guidance as we all gain experience in applying the IEMS concept to real-world situations.

IEMS will not increase our emergency management capabilities overnight. I ask that you be patient and that you approach the implementation with the same cooperative attitude you have demonstrated so often in the past. I also urge you to share your experiences with us through your normal channels. With your help, FY 1984 can be the beginning of an effective, enduring process for building and maintaining our Nation's emergency management capabilities.

Louis O. Giuffrida
Director

CONTENTS

GLOSSARY OF ACRONYMS

ABAG	-	Association of Bay Area Governments, San Francisco, California
CCA	-	Comprehensive Cooperative Agreement
CY	-	Calendar Year
DOT	-	Department of Transportation
EPA	-	Environmental Protection Agency
FEMA	-	Federal Emergency Management Agency
FY	-	Fiscal Year
FmHA	-	Farmers Home Administration
IEMS	-	Integrated Emergency Management System
MYDP	-	Multi-Year Development Plan
MCE	-	Maximum Credible Event
NCC	-	National Climatic Center
NETC	-	National Emergency Training Center
NGA	-	National Governors' Association
NOAA	-	National Oceanic and Atmospheric Administration
NRC	-	Nuclear Regulatory Commission
NTSB	-	National Transportation Safety Board
NWS	-	National Weather Service
SBA	-	Small Business Administration
SLPS	-	State and Local Programs and Support Directorate (FEMA)

I. GENERAL

A. PURPOSE

The purpose of this guide is to provide a resource for use by State and local officials in preparing an analysis of hazards. By presenting a general approach, definitions, processes, and models, it is hoped that a common framework for local, State and nationwide analysis of hazards will be established.

B. INTRODUCTION

The Federal Emergency Management Agency (FEMA) is developing an Integrated Emergency Management System (IEMS) approach to comprehensive emergency management. The initial step in this approach is the systematic analysis of the hazards in individual communities or jurisdictions.

Before a community can plan how to deal with potential disasters, the hazards that can lead to these disasters must be identified and priorities for action must be assigned. Hazards analysis is an essential element in disaster preparedness planning to minimize loss of life, human suffering and damage to public and private property. The principal objectives in preparing this guide have been to:

- outline for State and local governments a method of identifying the hazards which have the potential to cause loss of life and property damage and,
- provide a basic method for analyzing and ranking the identified hazards.

This guide incorporates material developed by the National Governors' Association (NGA), the Association of Bay Area Governments (ABAG) in San Francisco, California, contractors to FEMA, and other organizations.

The term "hazards analysis" is used throughout this guide. Other writings treat the same subject under the terms vulnerability assessment, loss study or analysis. Because vulnerability is one of several aspects of the analysis of hazards, the more general term hazards analysis was chosen.

As a final note, the term "community" is used to denote the area being studied and analyzed, such as a county, or any other jurisdiction.

C. WHAT IS HAZARDS ANALYSIS?

Hazards analysis is a process for determining the emergency management needs of a community. One aspect involves knowledge of the kinds of hazards to which the community is subject. This knowledge includes the

probability of the event occurring at varying levels of intensity at varying locations throughout the community. Determinations of probability, intensity and location can be made on the basis of historical evidence, empirical research or community perception. There are hazardous events which occur frequently but do little damage and therefore create little more than routine emergency needs. There are also events which occur infrequently (or may not have occurred but could occur), yet would have catastrophic effects and require extraordinary emergency management responses. For some hazards, historical and quantitative data are available regarding their key characteristics, while for others we must rely upon assumptions of location, intensity and probability. To initiate the hazards analysis process, it may be possible to make a rough estimate of emergency management needs simply by collecting the information that is already available about hazards, without the cost of collecting new data.

Another aspect of the hazards analysis is knowledge of the community. This involves an inventory of the areas and resources of the community susceptible to damage and an assessment of the loss that would result from the occurrence of an event at a given intensity or location. This knowledge of the community includes such things as the number of people and the value of property that would be affected by an event, as well as the communications, transportation, food supply or other systems of society exposed to interruption or collapse.

When knowledge of hazards is combined with knowledge of their potential impacts on the community, the result is a measure of the vulnerability of the community. Adequate information about the hazards will enable a community to know how frequently damage from an event could occur, what the extent of the damage would be, and which portions of the community would be damaged. When the data for each hazard are combined, a community can determine its relative vulnerability to each hazard. This will allow assignment of priorities for emergency management needs.

All models for hazards analysis apply equally when either a very little or a substantial amount of data is available about the hazards and their impacts on the community. Obviously, the greater the base of data concerning the probability, intensity and location of hazards and impacts on the community, the more refined the hazards analysis can be. But in many cases, just the knowledge that the community is subject to a hazard will dictate the need for certain emergency management capabilities. The lack of detailed data about the nature of hazards and their impacts, therefore, should not be considered an obstacle to doing a first-cut hazards analysis. The approach set forth in this guidance document seeks to strike a balance between the need to develop a systematic basis for determining community emergency management needs and the limitations that can exist in both the resources and methodologies available for analyzing the characteristics and impacts of hazards in a multihazard context.

D. BACKGROUND

One of the most significant national efforts at multihazard vulnerability analysis occurred under the Disaster Relief Act of 1974 (P.L. 93-288). Through a development grant, States were able to prepare comprehensive emergency plans. A specified aspect of the plans was the preparation of a hazards analysis to identify specific major risks and probable consequences that might require special contingency plans. Although guidance for the preparation of a hazards analysis was issued in the form of criteria and checklists, the guidance was not prescriptive. Virtually no work at a national level has been done in developing guidance for communities to use in doing a comprehensive hazards analysis.

Experiences learned by FEMA, which have since been confirmed by the NGA bulletin entitled "Hazards Analysis--Where Do We Go From Here?", include the following:

- the majority of hazards analyses take one of two forms: indepth analysis of one type of hazard, or multihazard compilations that focus on individual hazard descriptions using historical accounts;
- only a few establish a method to rank or evaluate hazards;
- almost none suggest guidelines for setting priorities for organized emergency management activities;
- most include maps, graphs, and charts;
- often details are provided only for events which resulted in a Presidential declaration;
- in many cases the analysis is more fit for public information than for planning needs or for priority setting;
- many analyses are based on prevalent natural disaster hazards, and fail to include potential but unexperienced events;
- most agencies do not systematically research hazard agents or conditions; only ad hoc data are gathered for specific need;
- hazard data are scattered throughout various public and private agencies and vary greatly with regard to quality, utility and format;
- no one agency collects all relevant data on a specific disaster or emergency type; each agency collects only pieces of information as they pertain to that agency's responsibilities for specific emergencies; and
- no cross analysis or comparison is done of major events or hazard agents in order to pinpoint commonalities.

These findings suggest that the major challenge in the design of a hazards analysis method is to determine an appropriate balance between quantitative (mathematical) and qualitative (descriptive) techniques. The former provides for a more objective assessment, permits cross-hazards comparison and allows for measuring effects of mitigation alternatives; but appropriate input data are generally lacking, methods are available for only a few hazards, resource requirements are high, and the level of expertise required to use the methods is high. The latter does not require as much time, permits use of fewer resources, allows for less rigorous data gathering, requires less expertise, but does not permit cross-hazards comparison and ranking.

E. BENEFITS

A hazards analysis should:

- enable emergency managers to set priorities and goals commensurate with the degree of local public need for protection;
- provide descriptive information on every major hazard affecting a given area and a methodology for comparison of both similar and vastly different types of hazards;
- justify management decisions for altering program and staffing assignments that may vary from previous norms;
- substantiate decisions about resource allocations and justify budget requests;
- encourage identification of technological and research needs in emergency management;
- provide tools to raise the level of understanding of public officials and to influence the adoption of prevention/mitigation measures and the expenditures of resources to do so;
- enable the establishment of a viable national data base of hazard vulnerability and other relevant and comparable information for national IEMS planning;
- be presented and viewed as the foundation for future IEMS activities; and
- be sufficiently flexible to accommodate communities that have already performed hazards analyses.

F. DEFINITIONS

Use of this guide requires a common understanding of several terms. This guide will use these terms in the following manner:

Disaster/Emergency - An event that causes, or threatens to cause, loss of life, human suffering, public and private property damage, and economic and social disruption. Disasters and emergencies require guidance and resources that are beyond the scope of local agencies in routine responses to day-to-day emergencies and accidents, and may be of such magnitude or unusual circumstances as to require response by several or all levels of government - Federal, State and local.

Hazard - A potential event or situation that presents a threat to life and property.

Hazards Analysis - A review of the vulnerability of life, property, the environment, and social and economic activity to the actual or potential impact of hazards.

History - The record of occurrences of previous disasters or events.

Hazard Identification - The determination of possible hazards, their probability and intensity, and the impact area.

Maximum Threat - The greatest destruction that can be expected from an event.

Probability - The likelihood that an event will occur.

Vulnerability (or Risk) - The degree to which people, property, the environment, or social and economic activity - in short, all elements at risk - are susceptible to injury, damage, disruption, or loss.

The next three terms - State Emergency Plans, Emergency, and Major Disaster - though not used in this guide, are defined here to indicate the relationship of the definitions of disaster and hazards analysis to appropriate Federal regulations and other planning efforts:

State Emergency Plans - State plans which are designated specifically for State level response to emergencies or major disasters and which set forth actions to be taken by the State and local governments, including those for implementing Federal disaster assistance.

Emergency - According to the Disaster Relief Act of 1974 (P.L. 93-288), the term emergency means "any hurricane, tornado, storm, flood, high water, wind-driven water, (tidal wave) tsunami, earthquake, volcanic eruption, landslide, mudslide, snowstorm, drought, fire, explosion, or other catastrophe in any part of the United States which requires Federal emergency assistance to supplement State and local efforts to save lives and protect property, public health and safety or to avert or lessen the threat of a disaster."

Major Disaster - According to the Disaster Relief Act of 1974 (P.L. 93-288), the term major disaster means "any hurricane, tornado, storm, flood, high water, wind-driven water, (tidal wave) tsunami, earthquake,

volcanic eruption, landslide, mudslide, snowstorm, drought, fire, explosion or other catastrophe in any part of the United States which, in the determination of the President, causes damage of sufficient severity and magnitude to warrant major disaster assistance under this Act, above and beyond emergency services by the Federal Government, to supplement the efforts and available resources of States, local governments, and disaster relief organizations in alleviating the damage, loss, hardship, or suffering caused thereby."

G. CONTENTS OF A HAZARDS ANALYSIS

Hazards analysis is as much "art" as it is "science." That is, while "science," in many cases, can identify an area of impact, the probabilities, and the forces in effect, emergency managers will always need to apply their own emergency management expertise as well as a specialized knowledge of the geopolitical area being analyzed. Since there is an "art" involved, especially in multihazards analysis, more than one approach to hazards analysis is viable. Indeed, a hazards analysis can be considered as the formalized, structured system upon which emergency managers base their decisions.

A basic hazards analysis has several key steps: identification of hazards; collection of information; analysis of information; and the development and preparation of reports. Each of them is important and needs to be addressed in the hazards analysis process.

1. Identification of Hazards

This can be the simplest of all the steps since it can be considered complete by assembling a list of all hazards known to have occurred, or with a potential for occurrence, and the impacts of their occurrence.

Most hazards will be readily identifiable because an incident can be recalled. Natural hazards with no history, or some manmade hazards may be more difficult to identify.

The listing of the hazards should be as inclusive as possible. This guide displays a commonly used list of hazards (Table A - Types of Hazards). In most cases, it can be used to identify the possible hazards.

2. Collection of Information

A further step in the identification of actual and potential hazards is the collection of information on each hazard's own special kind of forces in effect; e.g., the wind aspect of hurricanes or the liquefaction aspect of earthquakes. Information on hazards that are more common may be more definitive and easier to get. The amount of information collected, and the time and resources spent on gathering information are flexible. The level of detail in the analysis will be directly related to the completeness of the information.

Certain kinds of information are important to a hazards analysis. Statistical information, such as the number of incidents, the losses incurred--measured in number of injuries and deaths, property damaged or destroyed--are all critical. Information on technical measures of severity (flood stage, hurricane type, Richter scale intensity, etc.) are critical and can be collected. Descriptive information that relates the statistics to other aspects of the community is also valuable.

During this step, information about the total community should be developed:

- o population and demographic characteristics;
- o maps showing physical aspects - roads, rivers, transportation routes, hospitals, schools, life support systems, communications;
- o industrial, manufacturing, agricultural, mining or other business centers; and

- o the location of fixed sites with hazard potential (e.g., nuclear power plants).

This information is gathered and organized mainly for the analysis of the hazards. It can also be used to develop reports for local officials and for public information to the community.

3. Analysis of Information

After the information is collected and organized, it must be analyzed. This guide will suggest a process through which judgments (called ratings) are made about each hazard in terms of certain criteria. The ratings are then assigned a score, and the scores are recorded and totaled. This analysis of the information can lead to ranking of the hazards in the community, and decisions can be made about priorities and planning activities.

In addition to the ranking and scoring process based on the information, this guide will also suggest a number of other ways to use the information.

4. Development and Presentation of a Report

When the information has been analyzed certain reports can be developed and used for the improvement of the community's emergency management capability. Some reports will be presented to local officials, others may be tailored for State or Federal officials, and still others may be disseminated to the public. This guide will suggest several ways in which these reports can be developed so that the analyzed information on hazards can be shared widely.

H. HAZARDS ANALYSIS AND MANAGEMENT

Hazards analysis is a critical part of emergency management planning and decisionmaking. Those hazards that pose a significant threat to a community need to be identified and analyzed. Plans and priorities need to be developed based on the hazards. To the more common types of hazards can be added those that have their base in technological, economic, or political development.

Each level of government, and the private sector, have general and specific responsibilities in hazards analysis. They will be briefly described.

1. Federal

The Federal Government, largely through FEMA, will continue to play a major role in providing financial and technical assistance for hazards analysis. , In earthquake hazards, for example the Federal Government may play a direct role in financing hazard vulnerability studies for high-hazard, high-risk areas, and in promoting mitigation, preparedness, and response activities in those areas. The same may be true for hurricane hazards analysis.

In a more general way, FEMA will encourage, and provide partial funding through the Comprehensive Cooperative Agreement (CCA) process, for hazards analysis at the State and local level. Guidance, technical assistance, and training will also be provided.

FEMA will continue to work with other departments and agencies of the Federal Government in the development of guidance and technical assistance that may be useful to the State and local process of hazards analysis.

FEMA will work to establish a national data base on hazards, their incident history, probability, and the vulnerability of a community to that hazard. Such information would be a valuable resource to State and local governments in developing an analysis for a given area, and a valuable source of information for planning at the national level.

2. State

Each State has its own responsibility to identify and analyze hazards. Each State also has a responsibility to manage a State-wide program through which local communities develop, over time, their own emergency management capability; this capability is based on each community's hazards analysis. In this respect, the State has responsibilities complementary to the Federal role, namely, to provide financial and technical assistance, and training on hazards analysis. The State also plays a coordinating and consolidating role by ensuring communities use guidance, such as this, in a consistent way.

3. Local Jurisdictions

Each community should undertake an analysis that addresses all hazards (natural, manmade, war-related) to which it is at risk. Based on the completed hazards analysis, a program to improve the emergency management capability can be developed. Each community can also develop materials for public officials and for public information.

II. HAZARDS ANALYSIS

A. INTRODUCTION

This section describes a process for use in assessing and evaluating hazards and summarizing the findings. This process reduces some of the inconsistencies of hazards analysis and promotes a common base for performing the analysis by defining criteria and establishing a rating and scoring system.

B. CRITERIA

The rating and scoring system is based on the use of four criteria:

- history
- vulnerability
- maximum threat
- probability

Each criterion is described below.

1. History

The history or the record of occurrences of previous disasters is important in hazards analysis. If a certain kind of disaster occurred in the past, we know that there were sufficiently hazardous conditions to cause the catastrophe. Unless these conditions no longer exist or unless they have been substantially reduced, a similar disaster may happen again.

History must be used with caution. No record of a specific incident in an area does not necessarily mean that there is no hazard or disaster potential. The Sylmar fault in the San Fernando earthquake in 1971 had no history of activity and had long been classified as inactive. Also the whole technical/social framework changes rapidly and new hazards may be created, or hitherto minor ones may develop, without these changes being recorded in the relevant history.

2. Vulnerability

All persons who might be killed, injured or contaminated and all property that might be destroyed, damaged, or contaminated, are vulnerable to disasters. To describe vulnerability, the number of people and the value of property in jeopardy is determined, giving information useful in establishing what is and what is not vulnerable.

Vital facilities and population groups of special concern can be identified in vulnerability descriptions. Some important classifications to consider are:

People		Property	
At home	In institutions	Vital facilities	Residences
Aged	Schools	Emergency facilities	Stores and
Handicapped	Hospitals	Transportation	warehouses
Children	In transit	systems	Offices and
Non-English		Hospitals	factories
Speaking		Utilities	Inventories
groups			
At work		Dams	Farm crops

Each community will have its own special "mix" of factors that should be described and analyzed in terms of vulnerability. The impact of potential hazards not physically located in the community, such as being within the ingestion pathway of a nuclear power plant in another county, or being downstream to an unsafe dam in another county, should be incorporated in vulnerability descriptions.

3. Maximum Threat

Maximum threat is the "worst case" scenario of a hazard. In determining it, the community's emergency manager will assume both the greatest event possible and the greatest impact (e.g., the occurrence of a maximum credible earthquake (MCE) at noon time on a weekday in the city of San Francisco). Knowledge of the impact of a hazard's maximum threat upon a community allows the emergency manager to be aware of the extreme needs in preparedness for protection of life and property. Maximum threat impact is expressed in terms of human casualties and property loss. Longer term consequences are developed through detailing the scenario and utilizing existing statistical analyses. In addition, secondary consequences (e.g., an MCE causing a dam failure) need to be estimated whenever possible. Further discussion of secondary effects can be found in Chapter III.

4. Probability

Probability is the likelihood that an event will occur. It can be expressed as the number of chances per year that an event of a specific intensity or one greater will occur. The use of a probability factor of one chance in 100 during a year may be the most practical.

It is acknowledged that there are similarities when considering the history and probability criteria. However, because of the recent development of a number of hazards (such as nuclear reactor incidents and hazardous materials accidents) and the amount of historical information for them, two distinct criteria are used in this hazards analysis approach. The rationale behind this distinction is that the probability rating for newly developing hazards would be decreased by combining probability and history criteria since there is a lack of historical information. In the same way, this methodology recognizes the importance of the historical criteria for those hazards that have been confronted and have occurred with a relatively high degree of frequency. It is

understood that the two criteria are related but it is felt that there is more value in distinguishing between the two than in combining them.

C. RATING SYSTEM

State and local officials and emergency planners may be confronted with a range of hazards to which their communities are vulnerable. The following rating system has been developed as a way to assess the hazards identified in a community.

In the rating system, each of the four criteria identified (paragraphs 1 - 4 below) for describing and assessing potential hazards (i.e, history, vulnerability, maximum threat, and probability) is assigned a descriptive term as follows:

The lowest rating - Low

The middle rating - Medium

The highest rating - High

The criteria for each hazard would be assigned one of the three ratings above. A general discussion of the rating system as it applies to each of the criteria follows. Some hazards have different guides for the three rating levels.

1. History Rating

If the record shows no occurrence or a single occurrence of a disaster event in the area for a period of 100 years, the historical rating is "Low." If such an event has occurred more than once but less than four times in the past 100 years, a rating of "Medium" is warranted. And if such an event has happened four or more times in 100 years, the rating is "High." If the hazard is relatively new, that is, there is no history available, the history criterion could be ranked as "Low."

2. Vulnerability Rating

Estimates of vulnerability can be derived by overlaying individual risk maps of identified hazards on a map of the community. Were do the people live in relation to the hazards; what is the land being used for; and what is the value of the property in or near the risk areas? Often, only a rough estimate can be made without great expense and effort.

The rating for the vulnerability of people who are exposed or affected in a community would be set up this way:

Vulnerability of People	Evaluation
Less than 1%	Low
1% - 10%	Medium
More than 10%	High

Vulnerability of Property	Evaluation
Less than 1% damaged or destroyed	Low
1% - 10% damaged or destroyed	Medium
More than 10% damaged or destroyed	High

3. Maximum Threat Rating

Maximum threat will have two aspects in virtually every hazard considered: (1) a high degree of impact upon life and property and (2) a low probability of occurrence. These aspects will bring the emergency manager to the decision of the cost effectiveness of planning for maximum threat. In most hazards, it may well be that preparedness measures for property are not cost effective, but in the preparedness for the safety of human life assumption of the "worst case" scenario should always be considered.

As with vulnerability, maximum threat can be expressed quantitatively. Percentages of the community/population impacted can be used. Again, since the forces in effect are high, near devastation can be presumed in the community/population affected.

Area of Community Impacted	Evaluation
Less than 5%	Low
5% - 25%	Medium
More than 25%	High

4. Probability Rating

The probability of a disaster can sometimes be estimated by using available data, but often such estimates are only educated opinions. Thoughts and opinions that entered into development of the estimate can be evaluated as follows:

Chances Per Year of a Disaster	Evaluation
Less than 1 in 1,000	Low
Between 1 in 1,000 and 1 in 10	Medium
Greater than 1 in 10	High

D. SCORING SYSTEM

The scoring system described in 1. below is related to the rating system. It permits the ranking of hazards. It may permit hazards to be compared to each other on a quantitative basis. It provides a means for identifying all those hazards that should be addressed in a community's emergency operations and mitigation plans.

1. Method

In the scoring system, each of the four criteria identified for describing and analyzing potential hazards is assigned a numerical value depending on the rating made. The three ratings and their respective numerical scores are:

Low	1 points
Medium	5 points
High	10 points

Since some criteria are judged to be more important than others, a weighting factor was established to "balance" out the total scoring. The following weights are used:

History	2
Vulnerability	5
Maximum Threat	10
Probability	7

A composite score for each hazard is arrived at by multiplying the score value assigned to each criterion by its weight and then summing the four totals. For example:

Hazard: Flood

History -	High	10 points	X	2 weighting factor	=	20 points
Vulnerability -	Medium	5 points	X	5 weighting factor	=	25 points
Maximum Threat -	High	10 points	X	10 weighting factor	=	100 points
Probability -	Medium	5 points	X	7 weighting factor	=	35 points
				Total Score	=	180 points

2. Threshold

A threshold can be used to refine the ranked list of hazards. A threshold score can be established which permits those hazards that have great frequency and can cause damage of major proportions to a community to "pass through." Those hazards that "pass through" can be given a higher priority for disaster preparedness planning. A "threshold" score of 100 points is proposed. Any hazard which has a total weighted score of 100 points or greater should be given the highest priority in disaster preparedness planning efforts. Those hazards which score less could be given a lower priority for planning, or else ignored in the development of a jurisdiction's emergency response plan. Table B, Summary of Findings, provides an illustration of a scoring system for a hypothetical community and an assessment of hazards that should be addressed in a community's plans.

3. Team Approach

One individual can conduct the hazards analysis. However, it is suggested that a team of three to seven persons be responsible for performing the hazards analysis. This is not an easy task. The review of information and the judgment related to rating each criterion is complex. The team approach, which uses the judgments of several individuals rather than one, will improve the level of thoroughness and add to the confidence of the completed hazards analysis.

The following approach is suggested:

- Each team member is provided with information on the criteria (history, vulnerability, maximum effect, and probability) for each of the hazards, and is provided a blank copy of the Summary of Findings (Table C) as a worksheet.

- Each team member rates each of the criteria for each hazard, enters the individual scores on a worksheet, and sums and enters the scores for each hazard.

- The worksheets of the team members are summarized and the average score is entered on the Summary of Findings for the community.

TABLE A

TYPES OF HAZARDS

Identify the potential hazards faced by the community -- include natural (e.g., hazardous materials accident), and war-related (e.g., nuclear attack). Use additional lines to indicate potential disasters not already listed which pose a hazard to your community.

	High	Medium	Low	Unsure
Earthquake				
Landslide				
Tsunami (Tidal Wave)				
Tornado				
Flood				
Severe Winter Storm				
Hurricane				
Drought				
Major Fire				
Volcano				
Levee/Dam Failure				
Transportation Accidents				
Train or Rapid Transit				
Ship				
Aircraft				
Power Failure				
Fuel Shortage				
Water Supply Failure				
Civil Disturbance				
Hazardous Materials				
Radiological Incident				
Nuclear Facility				
Nuclear Attack				

TABLE B

SUMMARY OF FINDINGS

Illustration of a scoring method for a community

Weighted Evaluation Factors

Hazard 1/		History	Vulnerability	Maximum Threat	Probability	Total Score 4/
	Factor Weight	2	5	10	7	-
Earthquake	Severity rating 2/	Medium 5	High 10	Medium 5	High 10	
	Subscore 3/	10	50	50	70	180
Hazardous Materials	Severity rating	High 10	Medium 5	Medium 5	High 10	
	Subscore	20	25	50	70	165
Tsunami 5/ (Tidal Wave)	Severity rating	Low 1	Low 1	Low 1	Low 1	
	Subscore	2	5	10	7	24
Flood	Severity rating	High 10	Medium 5	High 10	Medium 5	
	Subscore	20	25	100	35	180
Nuclear Attack	Severity rating	Low 1	High 10	High 10	Low 1	
	Scoring	2	50	100	7	159

Notes:

1/ Not all of the hazards that a community may be subjected to are included in this example.

2/ Severity rating assigned to the community evaluation (High = 10, Medium = 5, Low = 1).

3/ Subscore = Factor weight x severity rating.

4/ Total Score = Sum of subscores for a given hazard.

5/ Total Score for Tsunami = 24; this is an example of a hazard below the threshold level of 100.

TABLE C

SUMMARY OF FINDINGS

Worksheet

		Weighted Evaluation Factors				
		History	Vulner-ability	Maximum Threat	Prob-ability	Total Score
Hazard	Factor Weight	2	5	10	7	-
	Severity rating Subscore					
	Severity rating Subscore					
	Severity rating Subscore					
	Severity rating Subscore					
	Severity rating Scoring					

III. RELATED HAZARDS ANALYSIS ACTIVITIES

A. INTRODUCTION

In the description of the process, there were a number of activities that were suggested as being helpful. These and other activities which can be used to present the results of the hazards analysis, and to maintain the hazards analysis at a current level, are described in this Chapter.

B. HAZARDS ANALYSIS PACKAGE

In addition to the Summary of Findings, a community might also wish to prepare and maintain a complete set of information materials on its hazards. A package, or set of such information, might be organized in this way:

- Introduction
  - the purpose in compiling the information
  - the importance of a hazards analysis in both the planning process and in the overall management process
- Community demographics
  - population statistics
  - income statistics
- Community map
  - high and low elevation points
  - highway use (include bridges)
    - identification of highways that may be used for transportation of hazardous materials
    - evacuation routes
  - airports, railroads, harbors, and other transportation facilities
  - industrial and economic bases
- Total list of hazards identified
- Description of individual hazards using information such as:
  - description

- physical characteristics

- frequency and location of occurrence; how many occurrences;

  amount (number of homes and businesses destroyed, people injured) and types of damage; likelihood of occurrence in a particular part of the community and in a particular time frame; factors that affect the severity of the hazard (e.g., development in a flood plain, or on a known earthquake fault); cause of the occurrence; list of Presidential Emergency and Major Disaster Declarations, and information pertinent to those actions.

o Concluding statement

- summarize the probable impact of hazards in the community in terms of property losses, fatalities, injuries, and disruptions to life in the community

- provide a reasonable plan of action for officials to take necessary actions.

C. SECONDARY EVENTS TRIGGERED BY DISASTERS

Some disasters set off other types of catastrophes in a cascade of effects that lead to a highly complex situation (See Figure 1, A Cascade of Disasters). Table D, Secondary Events, gives an idea of primary (triggering) and secondary (triggering) events that could be of major consequences in certain areas; a blank form (Table D.1) is included for your use. Emergency managers should note that it is generally more useful to consider all secondary events as a part of, and in the context of, the overall situation created by the primary (triggering) event. The accompanying tables are provided to assist users in accounting for the types of hazards and their impact that may not normally be taken into consideration during the analysis process.

D. EMERGENCY INCIDENT REPORT

An important step in developing and maintaining an up-to-date hazards analysis is a system for collecting incident reports. It is recommended that a standardized report form be developed to collect information on all incidents, over and beyond the routine day-to-day police and fire emergencies. Data from these reports can serve two purposes. First, they can provide justification for requesting Federal assistance following a disaster. Second, they will help build a historical data base, and thereby keep the hazards analysis current. Table E, Governors' Emergency Report, provides an example format. A blank worksheet is provided at Table E.1.

E. RISK MAP

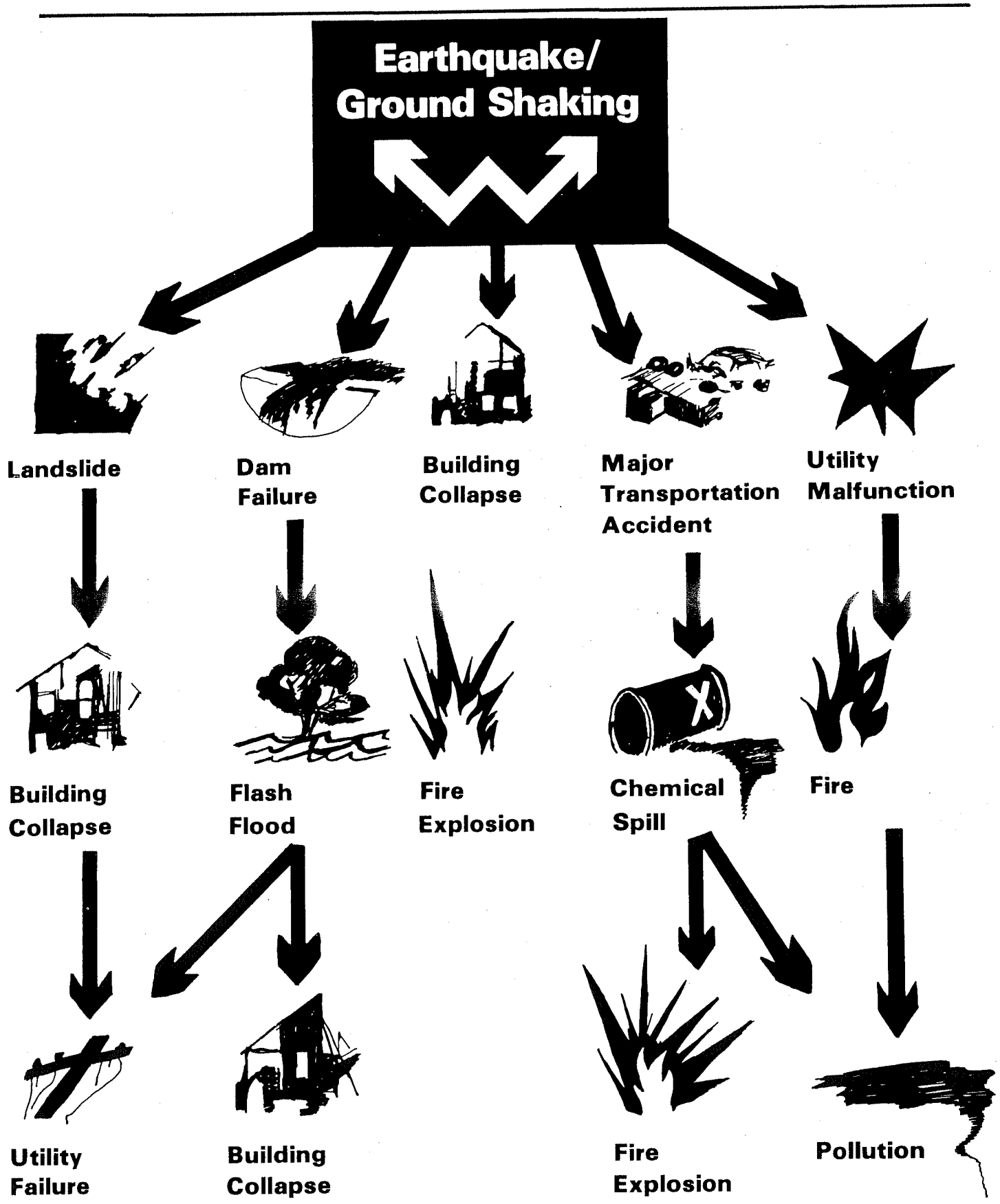
A useful tool for orienting and motivating executive and legislative policy makers is an all-risk overlay map. This is a large, multicolored map of the community with multiple clear acetate (transparency) overlays. Data identified and collected through preparation of the hazards analysis can be used as input to the all-risk map.

Start with a map of the area. Reproduce the outline of the community on numerous acetate sheets and attach them so they overlap each other. Each overlay should depict a particular hazard or the location of relevant hazard sources, including:

- Earthquake risk areas;
- Flood plain areas;
- Hurricane, tornado and other wind storm "alleys";
- Landshift and subsidence risk areas;
- Livestock, crop and forest areas subject to drought, blight, infestation, freeze, contamination and other adverse conditions;
- Dams - Federal, State, local, and private - with those above population centers specially keyed;
- Transportation system - airports, railroads, highways, waterways, ports;
- Mines, with their products and hazard areas;
- Pipelines - crude oil, natural gas;
- Manufacturing plants and refineries - chemical, petroleum, other;
- Toxic substances dump sites;
- Recurring pollution, epidemic, health problem zones;
- Nuclear power plants - planned, licensed, operating-hydroelectric power plants, electric generating plants and high voltage transmission lines;
- Strategic nuclear attack targets;
- Recent disaster sites;
- Land use characteristics; and
- Geographical features.

Figure 1

A cascade of disasters from one triggering event



Secondary Events

Table D

Secondary events that can be triggered by a disaster.

Secondary Events

Primary Disaster (Triggering)	Landslide	Tsunami	Blast	Flash Flood	Slow-Rise Flood	Fallout	Fire	Levee/Dam Failure	Transportation Accident	Train or Rapid Transit	Ship	Aircraft	Power Failure	Fuel Shortage	Water Supply Failure	Hazardous Materials	Radiological Incident
Earthquake	●	●					●		●	●	●				●	●	●		●	●
Landslide				●					●	●	●				●	●	●			
Tsunami (Tidal Wave)									●	●		●			●		●		●	●
Tornado							●			●	●				●					
Flood	●								●	●	●				●		●			
Severe Winter Storm	●			●	●				●	●	●	●	●		●	●				
Hurricane				●	●										●	●	●		●	
Drought							●										●			
Major Fire															●				●	
Volcano	●						●		●						●					
Levee/Dam Failure				●	●					●	●				●		●		●	●
Transportation Accidents							●								●				●	●
Train or Rapid Transit							●								●				●	●
Ship																			●	
Aircraft							●								●				●	●
Power Failure																				
Fuel Shortage																				
Water Supply Failure																				
Civil Disturbance							●			●	●	●	●		●	●	●		●	●
Hazardous Materials							●													
Radiological Incident			●			●	●						●							
Nuclear Facility			●			●	●						●						●	●
Nuclear Attack			●	●		●	●		●	●	●		●		●	●	●		●	●

LEGEND: Secondary events that could be of major consequence in a selected area are presented in this listing.

Secondary Events

It may be useful to complete this Table and include it in the Hazards Package described in this chapter.

Table D.1

Secondary events that can be triggered by a disaster.

Primary Disaster (Triggering)	Landslide	Tsunami	Blast	Flash Flood	Slow-Rise Flood	Fallout	Fire	Levee/Dam Failure	Transportation Accident	Train or Rapid Transit	Ship	Aircraft	Power Failure	Fuel Shortage	Water Supply Failure	Hazardous Materials	Radiological Incident
Earthquake																	
Landslide																	
Tsunami (Tidal Wave)																	
Tornado																	
Flood																	
Severe Winter Storm																	
Hurricane																	
Drought																	
Major Fire																	
Volcano																	
Levee/Dam Failure																	
Transportation Accidents																	
Train or Rapid Transit																	
Ship																	
Aircraft																	
Power Failure																	
Fuel Shortage																	
Water Supply Failure																	
Civil Disturbance																	
Hazardous Materials																	
Radiological Incident																	
Nuclear Facility																	
Nuclear Attack																	

GOVERNORS' EMERGENCY REPORT (CY 1981, No. 61) State: Maryland Fed. Reg.: III

Jurisdiction(s) involved: Frederick, Baltimore and Upper Montgomery Counties/Apple Creek Valentine River
Reporter: S. Jones/DEM Date: 7/15/81
Congressional Districts: 47
State Sen. Districts: 7, 21, 23
State Rep. Districts: 5, 11, 12, 19
Total area population: 230,000
Type of Incident: Severe storms, winds & flooding following tropical storm Alice
Start date: 6/1/81 Duration: 2 days Date/time 1st public warning: 5/31, 07:15
Local agencies on scene: Cy Sheriff, Fdk. Airport CAP, Boy Scouts, City EOC 6/1 02:30
State help requested: ☐ No ☒ Yes Type given: National Guard for S&R security, Decl.
Lead agency tasked: DEM Date/time alerted: 5/30 23:07 Date/time on-site: 6/1 07:40
Private Sector: Deaths 0 Injuries 123 Hospitalized 60 Treated/released 210
Evacuated 1,455 Sheltered 450 Temp. hsg. 80 Other

Total Area Damage Estimates ($000)	Homes	Apts., Multi-Family Res.	Mobile Homes	Bus. & Ind.		Agriculture		
				Bldgs.	Equip.	Bldg./Eq.	Crops	Stock
Destroyed (=85%+)	# 2	# 2	# 1	# -	# -	# 21	# 200	# -
	$ 90	$ 45	$ 25	$ -	$ -	$ 246.6	$ 1.4	$ -
Damaged (=10-84%)	# 4	# 4	# 4	# 251	# -	# -	# -	# -
	$ 2.2	$ 1.8	$ 1.9	$ 1,255.9	$ -	$ -	$ -	$ -
Est. Cost Repairs	$ 92.2	$ 46.8	$ 26.9	$ 1,255.9	$ -	$ 246.6	$ 1.4	$ -
Insurance %	80%	50%	100%	100%	-	23%	0%	-

Bus. closed: 1-7 days 696 8-30 155 30+ 15 Unemployed: 1-7 days 12,560 8-30 1,550 30+ 650

Public Facilities: Roads: 34 mi. @ $65,200 Bridges 3 @ $156,000 Culverts 2 @ $5,900
Water Control: Dams 0 @ $0 Levees 1 @ $152,000 Channels 1 @ $4,100
Buildings: 4 @ $34,200 Supplies/inventory 0 Vehicles/equip. 2 @ $2,300
Utilities: Water $34,300 Sewer $ 5,200 Light/power $3,500 Other 0
Effects: 16 families isolated lower Berry Twp 2 days; parts Berry Twp no water/power 3 days; Carter Twp sewers ruptured; 4 detours delayed 15,000 commuters 2+ hrs Apple Creek
Recovery: Est. duration: 60 da - 12/18 mo Special needs: welfare assistance

COSTS ($000)	Private	Local	State	Federal	Total
Debris clearance	$ 180	$ 30	$ 5	$ 10	$ 225
Life/health safety actions	$ 65	$ 28	$ 12	$ 6	$ 111
Property safety actions	$ 17	$ 25	$ 14	$ 2	$ 58
Road repair	$ 75	$ 30	$ 8	$ 11	$ 124
Public prop. repair/replacement	$ 0	$ 310.7	$ 100	$ 52	$ 462.7
Private prop. repair/replacement	$ 1,615.8	$ 2	$ 2	$ 50	$ 1,669.8
Staff: overtime, new hires, expenses	$ 50	$ 18	$ 14	$ 5	$ 87
Special services	$ 10	$ 17	$ 3	$ 4	$ 34
	$ 2,012.8	$ 460.7	$ 158	$ 140	$ 2,771.5

Special problems Sheriff released wrong damage info; Health dept/Cy Judge turf battle; insufficient flood insurance program Berry Twp/Cy
Recommendations Construct new levees, relocate @ 50 homes; raise/reinforce rte 694 through Berry Twp; promote Ag. & multi-family dwelling insurance

Declaration Status: ☒ Local Issued ☒ State Issued ☒ Special Issued ☒ Presidential Request ☐ Presidential Issued

SBA, FmHA E X MD ___ E ___ MD ___

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Table E.1

GOVERNORS' EMERGENCY REPORT (CY 19___, No. ___) State: _____ Fed. Reg.: _____

Jurisdiction(s) involved: _____ Reporter: _____ Date: _____

_____ Congressional Districts: _____

_____ State Sen. Districts: _____

Total area population: _____ State Rep. Districts: _____

Type of Incident: _____

Start date: _____ Duration: _____ Date/time 1st public warning: _____

Local agencies on scene: _____

State help requested: ☐ No ☐ Yes Type given: _____

Lead agency tasked: _____ Date/time alerted: _____ Date/time on-site: _____

Private Sector: Deaths _____ Injuries _____ Hospitalized _____ Treated/released _____

Evacuated _____ Sheltered _____ Temp. hsg. _____ Other _____

Total Area Damage Estimates ($000)	Homes	Apts., Multi-Family Res.	Mobile Homes	Bus. & Ind.		Agriculture		
				Bldgs.	Equip.	Bldg./Eq.	Crops	Stock
Destroyed (=85%+)	#	#	#	#	#	#	#	#
	$	$	$	$	$	$	$	$
Damaged (=10-84%)	#	#	#	#	#	#	#	#
	$	$	$	$	$	$	$	$
Est. Cost Repairs	$	$	$	$	$	$	$	$
Insurance %								

Bus. closed: 1-7 days _____ 8-30 _____ 30+ _____ Unemployed: 1-7 days _____ 8-30 _____ 30+ _____

Public Facilities: Roads: _____ Bridges _____ Culverts _____

Water Control: Dams _____ Levees _____ Channels _____

Buildings: _____ Supplies/inventory _____ Vehicles/equip. _____

Utilities: Water $_____ Sewer $_____ Light/power $_____ Other _____

Effects: _____

_____

Recovery: Est. duration: _____ Special needs: _____

COSTS ($000)	Private	Local	State	Federal	Total
Debris clearance	$	$	$	$	$
Life/health safety actions	$	$	$	$	$
Property safety actions	$	$	$	$	$
Road repair	$	$	$	$	$
Public prop. repair/replacement	$	$	$	$	$
Private prop. repair/replacement	$	$	$	$	$
Staff: overtime, new hires, expenses	$	$	$	$	$
Special services	$	$	$	$	$
	$	$	$	$	$

Special problems _____

_____

Recommendations _____

_____

Declaration Status: ☐ Local Issued ☐ State Issued ☐ Special _____ Issued ☐ Presidential Request E___ MD___ ☐ Presidential Issued E___ MD___

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IV. EXAMPLE WORKSHEETS FOR SELECTED HAZARDS

A. INTRODUCTION

To assist the individual or team in analyzing and rating hazards, to enable them to make as sound a judgment as possible, and to improve the consistency of ratings done in many different communities, three hazards will be described in general terms, and a way of analyzing each of the criteria will be set out.

Each of the three hazard descriptions follows the same format:

- definition
- references
- history
- vulnerability
- maximum threat
- probability

Samples of hazard description formats for a natural disaster (tornado), (Part B); man-caused disaster (hazardous material), (Part C); and attack-related disaster (nuclear attack), (Part D); follow.

B. TORNADO HAZARD

DEFINITION:

A tornado is a violent whirl of wind that can range in size from a few hundred feet to a mile in diameter. Tornadoes form in severe thunderstorms and travel over the ground at 20 to 40 mph. Maximum winds can exceed 300 mph.

REFERENCES:

FEMA and NOAA disaster preparedness materials available through local or regional National Weather Service (NWS) office.

Basic text on meteorology in local library.

HISTORY:

A record of tornado incidents for the past 100 years.

Information on tornado occurrences is available from:

- The National Climatic Center, Asheville, N.C.
- Local newspapers, records, and residents
- Local or regional NWS office.

Based on the number of tornado incidents, and using the scale below as a point of reference, rate the history criterion in the community:

0 to 1 incident	Low
2 to 3 incidents	Medium
more than 3 incidents	High

For this community, the history criterion is rated as _____.

VULNERABILITY:

All persons who might be killed or injured and all property that might be destroyed by a tornado should be considered.

Information on vulnerability is available from local demographic and property records.

Based on available information, and using the scale below as a point of reference, rate the vulnerability of a community giving consideration to the number of casualties likely to be experienced:

less than 1%	Low
1% to 10%	Medium
more than 10%	High

For this community, the vulnerability criterion for casualties is rated as _____.

Based on available information and using the scale below as a point of reference, rate the vulnerability of the community giving consideration to the dollar value of property likely to be damaged/destroyed as the result of a tornado:

less than 1% destroyed/damaged	Low
1% to 10% destroyed/damage	Medium
more than 10% destroyed/damaged	High

For this community, the vulnerability criterion for property is rated as _____.

For both people and property, the final rating of the vulnerability criterion is the higher of the two separate ratings. The rating for this community is _____.

MAXIMUM THREAT:

The greatest destruction in terms of loss of life, injury, and property loss that can be considered from a single maximum event. The worst case scenario is based on a tornado with winds of 300 mph, passing across the most populated part of the community.

Information necessary to analyze maximum threat is basically the same as that used for vulnerability.

Based on that information, and using the scale below as a point of reference, rate the maximum threat to a community giving consideration to the number of casualties likely to be experienced:

less than 5%	Low
5% to 25%	Medium
more than 25%	High

For this community, the maximum threat criterion for casualties is rated as _____.

Based on available information and using the scale below as a point of reference, rate the maximum threat to dollar value of property likely to be damaged/destroyed as the result of a tornado:

less than 5% damaged/destroyed	Low
5% to 25% damaged/destroyed	Medium
more than 25% damaged/destroyed	High

For this community the maximum threat criterion for property is rated as _____.

As in determining the vulnerability criterion rating, the final rating of the maximum threat criterion is the higher of the two separate ratings. The rating for this community is _____.

PROBABILITY:

The number of chances per year that a tornado incident could occur.

Information on the probability of a tornado occurring in a community is available from:

- Local or Regional NWS office
- National Climatic Center, Asheville, N.C.
- State climatologist

Based on available information, and using the scale below as a point of reference, rate the probability of a tornado of the occurrence of average severity:

less than 1 in 1,000 chances	Low
between 1 in 1,000 -- 1 in 10	Medium
greater than 1 in 10	High

For this community, the probability criterion is rated as _____.

Transfer the ratings for the four criteria to the Summary of Findings (Table C). Follow the directions there in translating each rating to its numerical score, multiply by the weight of the criterion, and enter the total score on the Summary of Findings.

C. HAZARDOUS MATERIAL ACCIDENT/INCIDENT

DEFINITION:

Contingencies in which the effects of toxic materials may cause death and injury to persons, and damage and destruction to property and the environment.

Hazardous materials contingencies can be classified by:

- types of material: (radioactive, non-radioactive, micro-biological)
- sources: fixed facilities (nuclear and non-nuclear); transport (airplanes, pipelines, etc.)
- effects: immediate (release and spills); long-term incremental (air and water pollution)

REFERENCES:

- U.S. DOT - Hazardous Materials Incidents
- U.S. EPA - Incident Activity Report - weekly
- National Transportation Safety Board - reports
- Nuclear Regulatory Commission - annual report

Note: This hazard is generic with many different kinds of subtypes. Each of these subtypes could be analyzed and reported separately, or a single generic hazardous materials analysis could be done.

HISTORY:

A record of hazardous materials accidents/incidents for the past 100 years.

Only certain types of hazardous materials contingencies are amenable to the history criterion: transportation accidents; oil spills from oil drilling platforms; disease/epidemics caused by toxic materials; fires and explosions; occupational incidents/accidents; actual releases from fixed nuclear facilities.

Information on hazardous material occurrences is available from:

- the sources cited above
- local newspapers, records, and residents

Based on the number of hazardous material accidents, and using the scale below as a point of reference, rate the history criterion in the community:*

o 0 - 1 incidents	Low
o 2 - 3 incidents	Medium
o more than 3	High

For this community, the history criterion is rated as

*This scale and the scales for the other criteria are based on an analysis for a hazardous material subtype, e.g., transportation accidents. If the team decides to do a single hazardous material analysis, we suggest that the scale intervals would be increased proportionately by the number of subtypes included. For example, if there are five subtypes then the scale would be as follows:

0 - 5 incidents (5 times the interval of 1)	Low
6 - 15 incidents	Medium
more than 15 incidents	High

VULNERABILITY:

All persons who may be killed or injured, or contaminated, all property that may be damaged or destroyed, and potential effects upon the environment should be considered.

Information on vulnerability is available from local demographic and property records. Based on available information, and using the scale below as a point of reference, rate the vulnerability of the community giving consideration to casualties from a hazardous material accident:

less than 1%	Low
1% - 10%	Medium
more than 10%	High

For this community, the vulnerability criterion for people is rated as _____.

Based on available information, and using the scale below as a point of reference, rate the vulnerability of the community giving consideration to the dollar value of property damaged or destroyed from a hazardous material accident:

less than 1% damaged/destroyed	Low
1% - 10% damaged/destroyed	Medium
more than 10% damaged/destroyed	High

For this community, the vulnerability criterion for property is rated as _____.

The final rating for the vulnerability criterion is the higher of the two separate ratings. For this community the rating is _____.

MAXIMUM THREAT:

The greatest destruction in terms of loss of life, injury, and property loss that can be considered from a single maximum event. Most individual hazardous material accidents would likely exceed the "Low" rating. A worst case event might be developed from an incident at a fixed nuclear facility, or an explosion related to a transportation accident in a major metropolitan area.

Information necessary to analyze maximum threat is basically the same as that used for vulnerability.

Based on that information, and using the scale below as a point of reference, rate the maximum threat to people, giving consideration to casualties from a single worst case hazardous material accident:

less than 5%	Low
5% - 25%	Medium
more than 25%	High

For this community, the maximum threat criterion for people is rated as _____.

Based on available information, and using the scale below as a point of reference, rate the maximum threat to the dollar value of property likely to be damaged or destroyed as the result of a single worst case hazardous material accident:

less than 5% property damaged/destroyed	Low
5% to 25% damaged/destroyed	Medium
more than 25% damaged/destroyed	High

For this community, the maximum threat criterion for property is rated as _____.

The final rating for the maximum threat criterion is the higher of the two separate ratings. For this community, the rating is _____.

PROBABILITY:

The number of chances per year that a hazardous material accident could occur.

Based on available information, and using the scale below as a point of reference, rate the probability of a hazardous material accident in a given year.

less than 1 in 1,000 chances	Low
between 1 in 1,000 chances -- 1 in 10	Medium
greater than 1 in 10	High

For this community, the probability criterion is rated as _____.

Transfer the ratings for the four criteria to the Summary of Findings (Table C). Follow the directions there in changing each rating to its numerical score, multiply by the weight of the criterion, and enter the total score on the Summary of Findings.

D. NUCLEAR ATTACK HAZARD

DEFINITION:

An attack upon the United States using nuclear weapons.

Nuclear attack poses special problems to the individual or team responsible for conducting a hazards analysis. Certain areas of the country identified as high risk or target areas are likely to experience direct weapons effects: blast, heat, and initial nuclear radiation. Other areas not identified as high risk or target areas, are likely to experience indirect weapons effects -- radioactive fallout. Therefore, no area can be considered exempt from the effects of nuclear attack. Radioactive fallout must be considered a potential threat to all persons.

Another problem is that, unlike other hazards that will be analyzed here, there is an absence of information on such criteria as history, maximum threat and probability. The vulnerability criterion can be analyzed in much the same way as it is analyzed for other hazards.

The process for analyzing and rating nuclear attack hazards will be slightly different based on the division of communities into those which could experience direct weapons effects or those which could experience indirect weapons effects and establishing fixed ratings for certain criteria.

REFERENCES:

Information on nuclear attack is available from

- FEMA - High Risk Areas for Civil Nuclear Defense Planning Purposes (TR-82)
- Other FEMA publications
- Strategy for survival
- References available in local public libraries.

HISTORY:

In the absence of a historical record of occurrences since World War II, the rating for all communities will be expressed as Low.

VULNERABILITY:

All persons who might be killed or injured and all property that might be destroyed.

Information on vulnerability may be available in existing emergency response plans for an area or from the State Office of Emergency Management.

Based on available information, and using the scale below as a point of reference, analyze the nuclear attack using rating scale 1 or 2:

1. Communities experiencing direct weapons effects.

People

less than 1% killed or injured	Low
1% to 10% killed or injured	Medium
more than 10% killed or injured	High

The rating for your community as to the vulnerability of people is _____.

Property

less than 1% damaged/destroyed	Low
1% to 10% damaged/destroyed	Medium
more than 10% damaged/destroyed	High

The rating for your community as to the vulnerability of property is _____.

The final rating for the vulnerability criterion is the higher of the two separate ratings. For this community, the rating is _____.

2. Communities experiencing indirect weapons effects.

People

less than 1% killed/injured	Low
1% to 10% killed/injured	Medium
more than 10% killed/injured	High

The rating for your community as to the vulnerability to nuclear attack is _____.

Caution: Assessment should be made on the assumption of population being unprotected.

MAXIMUM THREAT:

The greatest destruction in terms of loss of life, injury to persons, and property loss that can be expected from an all-out nuclear attack.

Based on the magnitude of that occurrence, the maximum threat rating for all communities will be expressed as "High."

PROBABILITY:

The number of chances per year that a nuclear attack incident could occur.

In the absence of information, the rating for all communities will be expressed as "Low".

Transfer the ratings to the Summary of Findings (Table C). Convert the rating for each criterion to its numerical value, multiply by the weight of that particular criterion, and enter the total score on the Summary of Findings.

GPO 902-147