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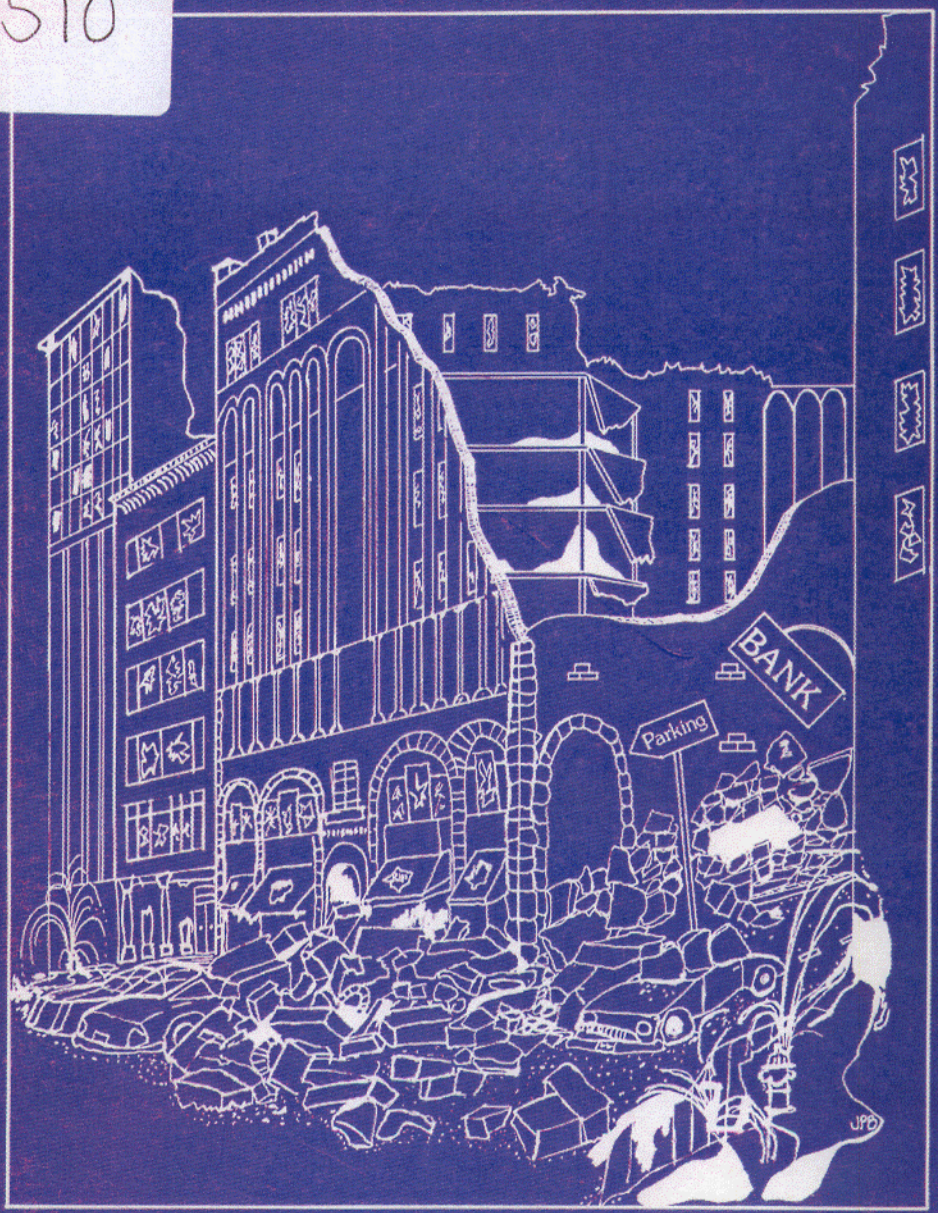

COMMUNITY RECOVERY FROM A MAJOR NATURAL DISASTER

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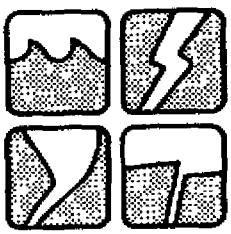

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PREFACE

A disaster, by definition, is an unscheduled, overwhelming event that causes death, injury, and extensive property damage. Nevertheless, there are things that are known about disasters and their impacts, even when the knowledge of when and where a disaster will hit is not known. Given this knowledge, there are actions that can be taken before, during, and after a disaster to reduce human hardship and property damage. The premise of this project is that by looking at community recovery in an organized way, human hardships can be minimized.

For four years, the project team has studied and documented how cities in the process of recovering from disaster do, in fact, accomplish the recovery. The focus of the research is on local governmental interaction and intergovernmental processes during the recovery period. To date, knowledge of the role of community officials in recovery and postdisaster mitigation activities has been limited. An essential part of this research was the onsite observations and case studies of 14 recovering communities in the United States.

Greater experiential knowledge about the recovery process, including the mitigation activities during that period, should have several practical benefits. We think that practical knowledge about recovery will 1) help local officials manage recovery more efficiently; 2) improve the ability to predict the relative ease or difficulty that a community will have in recovering from a major disaster; and 3) enhance understanding of how and why communities choose to take mitigative steps after a disaster. Improving the ability to predict the relative ease of community recovery also should be helpful to officials at other levels of government in determining the type and amount of assistance and resources to be provided to a disaster-affected locality. Although all

of the case studies and analysis completed to date are of United States communities, we think this new organizing framework provides a good first step for researchers interested in the recovery process in other societal settings.

ACKNOWLEDGMENTS

Four staff persons who assisted with the project for less than the full four-year period deserve credit. Charles Newton was Senior Research Associate from 1980-82. Ellen Barnes served ably as Administrative Assistant for almost four years. In the first year, Mary V. Wriynt and Phillip A. Hutchinson, Sr. were part of the project team.

Finally, we appreciate the assistance and patience of our Program Director at the National Science Foundation, Dr. William Anderson.

DEDICATION

To the unsung heroes and heroines of the disaster recovery process--the local public officials.

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PART ONE

RECOVERY

CHAPTER I

REVIEW AND INTRODUCTION

Over the last few decades in the United States, local capability to deal with and recover from major natural disasters has improved. Communities **do** recover, even if slowly and painfully in some instances. Although no communities hvae been "lost" involuntarily, public officials occasionally decide to relocate all or part of a community to avoid the likelihood of another disaster.

About 15 years ago, Allen Barton summarized what little research existed at that time about the disaster recovery process. One pattern he noted was that, "Local government is unable to cope with the overload of problems and is replaced by an improvised emergency government such as a Citizens' Committee, or by authorities from state or national agencies" (1969, p. 284). More recently, however, local governments have not been rendered ineffective nor supplanted by either public or private organizations. In recent years, both the growing ability of local public officials, and the experience and resources of emergency management personnel at the state and federal levels, have contributed to community ability to recover from a major natural disaster.

Since 1980, the year this recovery research began, there have been more than 100 major disasters in the United States, and the federal government has expended more than $4 billion for relief and recovery. It should be noted that these numbers include only major events (natural and human-caused) for which a Presidential Declaration of a disaster or emergency was issued. Other events had significant impacts on locales they affected, but did not meet the eligibility requirements for a declaration of a major disaster.

In federal fiscal years 1980 through 1984, 109 disasters and 15 emergencies merited a Presidential Declaration. The 109 disasters affected 703 counties seriously. In that four-year period, the dollar amount obligated by FEMA for those major disasters and emergencies was $1.8 billion. That total includes amounts spent for Public Assistance, Temporary Housing, Disaster Unemployment Assistance, and Individual and Family Grants. In addition, other federal agencies, including the Small Business Administration and Farmers Home Administration, spent $2.7 billion on disaster aid. The total federal assistance came to $4.4 billion in federal fiscal years 1980-84.*

Clearly then, since the federal government has a sizable investment in community relief and recovery, it is important to know not only where the money went, but how the recovery proceeded in places where tens of millions of dollars were spent. Further, it is instructive to know whether the money makes a difference. Knowledge about community recovery could improve the process and, possibly, reduce the time and costs of local recovery.

Previous Research

In the past decade, persons representing many disciplines have written on various aspects of recovery from natural disasters. Many reports have never been published, and others have presented results that may or may not be duplicated. Relatively few researchers have studied more than a single event and, hence, are not able to generalize about a variety of cases. A number of major themes occur in the natural disaster literature and on the agenda at major meetings of natural hazards and disaster researchers. A review of the agenda topics at the

*The data came from individual summary reports on declared disasters and emergencies prepared each fiscal year by FEMA.

University of Colorado's Natural Hazards Research and Applications Workshops in July of 1983 and '84 reveals a concern with: 1) disaster phases, and 2) functions and effects. The phases include hazard mitigation (e.g., flood plain and coastal management), preparedness activities, response activities, and recovery (human and community). The functions and effects involve assimilation of research and technology into practice, planning and implementation processes, and disaster impacts.

Researchers and public officials continue to grapple with the same fundamental problems--how to understand better and to cope more effectively with the four major phases of disasters and with the effects of major disasters. With respect to the four phases, the recovery phase appears to be the least researched and the most poorly understood. This is especially true of the long-term recovery period at the community level. Far more has been done to investigate and understand family and individual recovery; for examples, see Bolin (1982) and Bates (1982).

Similarly, a review of published natural disaster and hazards research shows that in the last several years, researchers have paid very little attention to the sociopolitical aspects of the long-term recovery process. Of greatest interest here are those analyses of the public administration aspects of community recovery and of the local economic impact of major natural disasters. Among the earlier publications most pertinent to this project are Dacy and Kunreuther (1969), Haas **et al.** (1977), Friesema **et al.** (1979), and Wright **et al.** (1979). Some individual community recovery experiences have been documented in Geipel (1982), and French **et al.** (1984), but few comprehensive analyses of the long-term recovery process have been made.

Of the 38 monographs published by the Natural Hazards Research and Applications Information Center in the last decade, only one deals with

community recovery after natural disaster: Haas, Kates and Bowden's Reconstruction Following Disaster, published in 1977. The volume grew out of research on the recovery processes in Managua, Nicaragua, after the great earthquake, and Rapid City, South Dakota, after the flood there. Secondary analyses were made of recovery in San Francisco and Anchorage after earthquakes.

Haas **et al.** described the recovery process and identified the mitigation opportunities during the recovery period:

> Disaster recovery is ordered, knowable, and predictable. The central issues and decisions are value choices that give varying emphasis to the early return to normalcy, the reduction of future vulnerability, or opportunities for improved efficiency, equity, and amenity. Over-ambitious plans to accomplish these goals tend to be counterproductive. Major opportunities to improve the reconstruction process lie in early recognition of overlooked problems, people, functions, and areas; the reduction of uncertainty about the future for those who live and work in the city; and the preparation for reconstruction before the disaster comes (p. xxvi).

The model of recovery activity timing depicted by Haas **et al.** (referred to as "the wave chart" by local officials in more than one community where we interviewed) did not always accurately reflect the experiences of the communities we studied. The start dates of the restoration and reconstruction phases were different from those specified in Haas **et al.**, for instance. This study made no effort to measure the amount of time each phase might take, or to examine the Haas **et al.** finding that there was a logarithmic progression in the duration of each phase. Finally, the researchers did not discern the seven basic reconstruction issues or the sequence and linkages among them cited by Haas **et al.**, on p. 45, in any of the places we studied. Haas **et al.** may have been suggesting that some logically follow others--and sometimes they do--but our research showed that issues frequently crop up in simultaneous or illogical sequences.

For example, in Coalinga, California, the recovery activities began almost immediately, because on May 3, 1983, virtually all the buildings that were not seismic-resistant were leveled by the earthquake. It was a case of "instant mitigation" since uninhabitable buildings looked that way. In the case of flood or tornado-damaged properties, many more structures look sound than actually are. A contrast in recovery timing was the situation in January of 1983, when several California counties (including Marin and Santa Cruz) suffered heavy rains that caused floods, landslides and debris flows. For many weeks after the Presidential Disaster Declaration was issued, mudslides and debris flows continued periodically; consequently, road and debris clearance went on for months. At the same time debris removal was going on, so were some recovery planning efforts. Recovery usually begins after response activities are nearly completed, but the amount of time needed for those activities depends in part on the nature of the disaster agent, the extent of the damages, and the availability of resources (human and material).

The work of Friesema **et al.** (1979) addresses the long-term community recovery process, but raises some basic methodological questions about measuring recovery. The group set out to study the long-range economic and social impacts of natural disasters on four communities, using aggregate indicators of community patterns available for a long period of time. In each case, the disaster had occurred at least a decade prior to their study. Friesema's basic method was "to gather time series data on various types of community performances for at least 10 years on either side of the disaster" (p. 16). The data were gathered primarily from secondary sources.

Friesema's team struggled with quantitative measures: "If the problems associated with finding adequate comparative measures of the

severity of disasters have seemed formidable, the problems of getting reasonably accurate measures of the comparative amount of external recovery assistance coming into communities following disasters has proved to be almost intractable" (p. 164). Since Friesema relied on data that was 1) primarily from secondary sources, 2) limited primarily to economic impacts, 3) about ten years old, and 4) from only four communities, that study was of limited usefulness to the project described here. Nevertheless, Friesema's painful experiences with quantitative measures served as a warning to our research team.

A second study headed by Wright (1979) determined natural disaster impacts by comparing census data from 1960 with those from 1970 on the number of housing units in areas that did and did not have a natural disaster. Again, their aggregate data-gathering and decade-long time period made this study of limited usefulness to this research project. Further, the approach used by Wright **et al.** cannot deal with the dynamic changes that are crucial to a measurement of disaster effects on economic growth and other local processes.

Wright's team reported that their quantitative approach, "is free and clear of some of the deficiencies of case studies" (p. 17). One of their findings--contrary to what we found in our study--was: "The implication is that the most serious impact of recovery problems will occur in small towns and rural or semi-rural communities--and, interestingly enough, the case study literature provides some support for this viewpoint" (p. 205). Our case study results did not show that small or rural communities had more difficulty recovering than others (see Chapter IV).

The Friesema **et al.** (1979) study of communities after natural disasters states:

> By and large, it appears to us that the American society and polity has become so knit together and the economy so integrated by the mid-20th century that most of the economic costs of natural disasters are externalized to the larger, carrying society. . . . It has occurred because local institutions have been economically, socially and politically integrated into the national society (p. 178).

Nevertheless, the focus on community impacts using aggregate indicators may mask severe personal impacts upon victims and others in the community. If communities are able to externalize many of the consequences and costs of natural disasters, as it appears they can, that is not to say that there aren't consequences and costs. We have, in fact, found a variety of impacts on local public management and finances resulting from a major natural disaster. However, our focus was the first 12 to 24 months after a major disaster.

A few more recent studies of recovery also should be mentioned. In the article, "Lake Elsinore Disaster: The 'Slings and Arrows of Outrageous Fortune'," Sandra Sutphen reviews a single recovery example using the Haas **et al.** (1977) book for her analytical model. Sutphen's work (1983) supported the basic observation of blocks of recovery activities, but did not reinforce the clear-cut sequence (or ebb and flow) of recovery period actions shown in the Haas **et al.** model of recovery activity. Robert Geipel, author of Disaster and Reconstruction: The Friuli (Italy) Earthquake of 1976 (1982), also studied one recovery example from which he derived his model. Geipel discusses the demographic and societal aspects of recovery, addressing mainly the social geography of the reconstruction process.

In "Recovery following the South Italian Earthquake, November 1980: Two Contrasting Examples," Frances D'Souza contrasts the ability of two small communities to assimilate relief and manage their recovery. D'Souza (1982) notes the importance of indigenous leadership as a major contributor to local recovery. She cites the Year I report

of this project, among other sources, in her analysis of the differing capabilities of the two Italian communities to recover.

The model or organizing framework offered as a result of this research project is not entirely a new one. The framework presented (see Figure II-1) is arranged to allow researchers and practitioners to make sense of the recovery process and to act on it. Additional actionable propositions are provided in Chapters III and IV.

Project Summary

This study was designed to contribute to the base of knowledge about long-term recovery and to produce an analytical framework for future studies of the recovery process. From 1980-84, the project team conducted empirical studies of communities recovering from natural disasters.

An extensive review of the existing disaster recovery literature revealed the need for more information on local public decision making during long-term recovery. The project staff decided to use the case study method to gather this information. A series of site visits of places recently struck by disasters was scheduled in order to interview key decision makers and to analyze local public planning and management processes, and intergovernmental relations. Provisions were made to monitor and assess key public policies and actions aimed at recovery--including the consideration of significant new mitigation measures and efforts at community betterment.

The first six case studies were completed in August of 1981; five more case studies were completed in November of 1982. Six additional case studies were done in 1983 (three new, three revisits), as was an analytical framework for the recovery process. This monograph incorporates all the case studies, presents the analysis of all 14 cases, and suggests a model of the recovery process.

Research Design

The selection of case study sites was based on such criteria as the nature of the disaster, geographic location, size, social and economic characteristics, local interest in the event and in the recovery process, and replicability of mitigation or recovery activities. To select the sample sites, the staff went through a series of steps:

1) Screen Presidential Disaster Declarations since 1977 for all natural disasters within continental U.S.

2) Categorize each by incident type.

3) Rank by dollar volume of damage (all were multimillion-dollar disasters).

4) Identify by state and locality to obtain geographic distribution.

5) Examine distribution to assure coverage of Atlantic, Gulf, and Pacific coasts, as well as inland locations.

6) Screen to assure documentation as to extent of disaster and recovery undertaken.

7) Screen to assure willingness of locality to participate in the study research and agree to interviews of local officials.

8) Examine disasters in different locations, but in same time frame.

9) Examine effect of same disaster on adjacent locations.

10) Consider travel budget limitations.

11) Consider elapsed time since disaster (interview public officials still in office to ensure more accurate recall).

Before the field interviews were conducted, the staff reviewed the files maintained by the Federal Emergency Management Agency (FEMA) for details about the declaration process, initial damage estimates, and federal/state agreements for each disaster site. Other secondary information--such as demographic data, copies of municipal budgets, and special reports on the sites--was gathered as well. In terms of specific disaster agents represented, the 14 examples cover four

riverine floods; three flood/mudslide events; two tornadoes; one hurricane; two winter, coastal storms; one earthquake; and one dam break/flood.

Next, a structured guide called a Field Report Outline (see Appendix A) was prepared for use by field team members in conducting the on-site interviews. Only six persons participated in the two-person teams used in the course of the 14 studies, which made it relatively easy to ensure uniformity in the individual case reports and to facilitate the comparative analysis of the experiences. The teams spent roughly four days in each community conducting interviews. In addition to documenting the disaster incident and the local response and recovery efforts, the researchers paid particular attention to local consideration of mitigation measures and to efforts at community betterment.

After the individual case studies were written up, a copy of each of the descriptions was sent to the community described for review of factual accuracy. The chief executive and staff in each place had the opportunity to offer corrections and comments to the research team.

Three localities, each a place of significant activity that could not be captured in a single trip, were visited twice. In some communities, the complex web of decisions by many parties could not be understood in a few days; in others, only time revealed the outcome of some decisions. In short, a full appreciation of the many dimensions of the recovery process could not be captured with just one cross-sectional view.

In order to aggregate the findings and to generalize from them, an analytic framework was needed. Previously completed recovery research was of relatively little help because of differences in aggregation, and

because none dealt with the role of key local persons in the recovery decision-making process, a consideration important to this project.

One of the analysis tools proposed was a modified version of pattern recognition, a variation of discriminant analysis. The project staff worked with Allan J. Lichtman, a professor at American University in Washington, who has pioneered the use of pattern recognition for social science applications. Difficulties arose around determining "effective recovery." We tried many ways to measure recovery as an outcome, but it may be better conceptualized as a process. Other researchers, such as Friesema **et al.** and Wright **et al.**, have used recovery as a dependent variable, but the difficulties are great and the results questionable.

As another possible approach, we decided to let local citizens and officials determine whether they were satisfied with the recovery in their locality. About 12 months after each disaster, a sampling of local public officials, civic leaders, and citizens were asked to complete a questionnaire on their perceptions of local recovery. However, not too surprisingly, that effort did not yield consistent enough results to contribute to an analytical framework. However, the questionnaire could, it was realized, be used to gain consensus about a local recovery strategy soon after a disaster occurred (see Appendix B).

The team decided that the real issue was not whether a community could recover or not (all have), but rather whether there are better or worse ways to go about recovering. After several meetings of the project team, it was decided that the qualitative data collected during field visits could not be analyzed by quantitative methods of analysis, and that we should stop procrustean attempts to do so.

We had chosen to do case studies because they yield rich data, and we remained faithful to the case study technique. Robert Yin, who has

written extensively about the case study as a serious research strategy, has provided the following definition (1984, p. 18):

> A case study is an empirical inquiry that:
>
> - investigates a contemporary phenomenon within its real-life context; when
> - the boundaries between phenomenon and context are not clearly evident; and in which
> - multiple sources of evidence are used.

In discussing the frequent complaint about case studies--the difficulty of generalizing from one case to another--Yin states (1984, p. 42):

> The problem lies in the very notion of generalizing to other case studies in the first place. Instead, an analyst should try to generalize findings to 'theory,' analogous to the way a scientist generalizes from experimental results to theory (note that the scientist does not attempt to select 'representative' experiments).

Recovery is an ongoing process and, therefore, difficult to measure once and have that suffice. Nevertheless, an explanatory, organizing framework can be provided with respect to long-term recovery. In Chapter II we present such a framework, based on analyses of the 14 case studies. A first step in the analysis was preparing an array of 44 variables (clustered under ten categories) that appeared to affect the recovery process. From analysis of independent variables, and from additional field work in 1983-84 (including second visits to three recovering communities), we arrived at the new organizing framework.

Chapters III and IV describe in detail the dynamics of the recovery process and influences on the effectiveness of recovery.

Finally, we wanted not only to describe our findings, but also to present them in such a way that they would be of practical assistance to public administrators. In Chapter V, we have used "Actionable Propositions" as a means of offering guidance, advice, and prescriptive information to local officials.

CHAPTER II

CONCEPTUALIZING THE LOCAL RECOVERY PROCESS

The long-term recovery process involves the repair or reconstruction of buildings and structures, the evaluation of existing building codes and land use regulations, and implementation of mitigation measures, both structural and nonstructural. Also included in this process are the planning and administrative activities entailed in identifying and securing the resources necessary to accomplish the above tasks. Recovery encompasses all domains of community life.

Framework

A description of some recovery activities in each main area of community life is provided below:

- **Residential**--the repair or reconstruction of houses; the repair or replacement of home furnishings, cars and trucks; the settling of insurance claims for damage to personal property; and the permanent resettling of displaced residents.

- **Business**--the repair or reconstruction of economically viable commercial, industrial, and retail establishments; and the return of retail sales, business-related tax revenues, and employment to predisaster levels.

- **Public services and facilities**--the resumption of water, sewer, electric, telephone and other basic services; the restoration of public transportation, parks, and recreational areas; the repair or reconstruction of public sidewalks, schools, libraries, hospitals, clinics, police stations, fire houses, and other municipal buildings; and progress on community projects that were planned or under construction prior to the disaster.

- **General population**--the return of certain social indicators (such as birth, death, and crime rates; alcoholism, child and spouse abuse; and welfare payments) to at least predisaster levels; and the implementation of other programs designed to restore or improve the quality of life for local residents.

- **Mitigation**--measures to reduce future losses such as the preparation or revision of a disaster plan; the construction of levees, dikes, breakwaters, and riprap; the implementation of projects such as the relocation of

persons living in high-risk areas; the purchase of disaster-related insurance; and the passage of land use ordinances and building codes.

All of these domains generally compete for a fixed number of dollars available for recovery activities. Decisions about allocations among domains (whether explicit or not) are part of a strategy for recovery. In recent years, however, federal and state disaster assistance has been such that recovery does not refer to community survival in the basic sense. There are, in fact, no ghost towns in the United States as a result of a natural disaster in recent times. Some communities have decided to relocate in part because of fear of future hazards, but that has been a calculated decision rather than an involuntary predicament.

Friesema **et al.** (1979) and others have investigated some of the economic aspects of the quality of life before and after a disaster, but to date many questions remain about the economic impact of a disaster on communities in the United States. If a community with a declining local economy has a disaster, has it recovered if it restores a quality of life that is lower than before the disaster, but higher than what it would have been had the disaster not occurred? These and related economic questions require additional study.

In addition, availability of funds and allocation of them, another influence on the recovery process is planning for the recovery process in advance of having the actual experience. Public officials (and others) can affect recovery process, with respect to speed, consumption of resource, and prevailing agenda, through the control of resources.

Public officials can learn from the experiences of others; they can learn how to prepare, how to move through the administrative processes more quickly, how to deal more effectively with the various levels of government usually involved in the postdisaster phase, and how to

control the demands for scarce or strained resources. State and federal officials can see to it that existing policies and regulations are not impeding the recovery process at the local level.

Figure II-1 shows the elements of recovery, and the relationships among them. The number of independent variables that were suspected to affect the recovery process are enormous. The preliminary analysis of the 14 case studies led to the identification and isolation of 44 separate variables, which we clustered under ten major categories, that may play a role in the recovery process. Nevertheless, once we constructed the organizing framework,* we were able to show the interaction among the key variables.

The contextual setting of the disaster-stricken community is found at the bottom of Figure II-1. The center of Figure II-1 shows the three principal elements of the recovery process. Finally, the outcomes of the recovery processes are seen at the top.

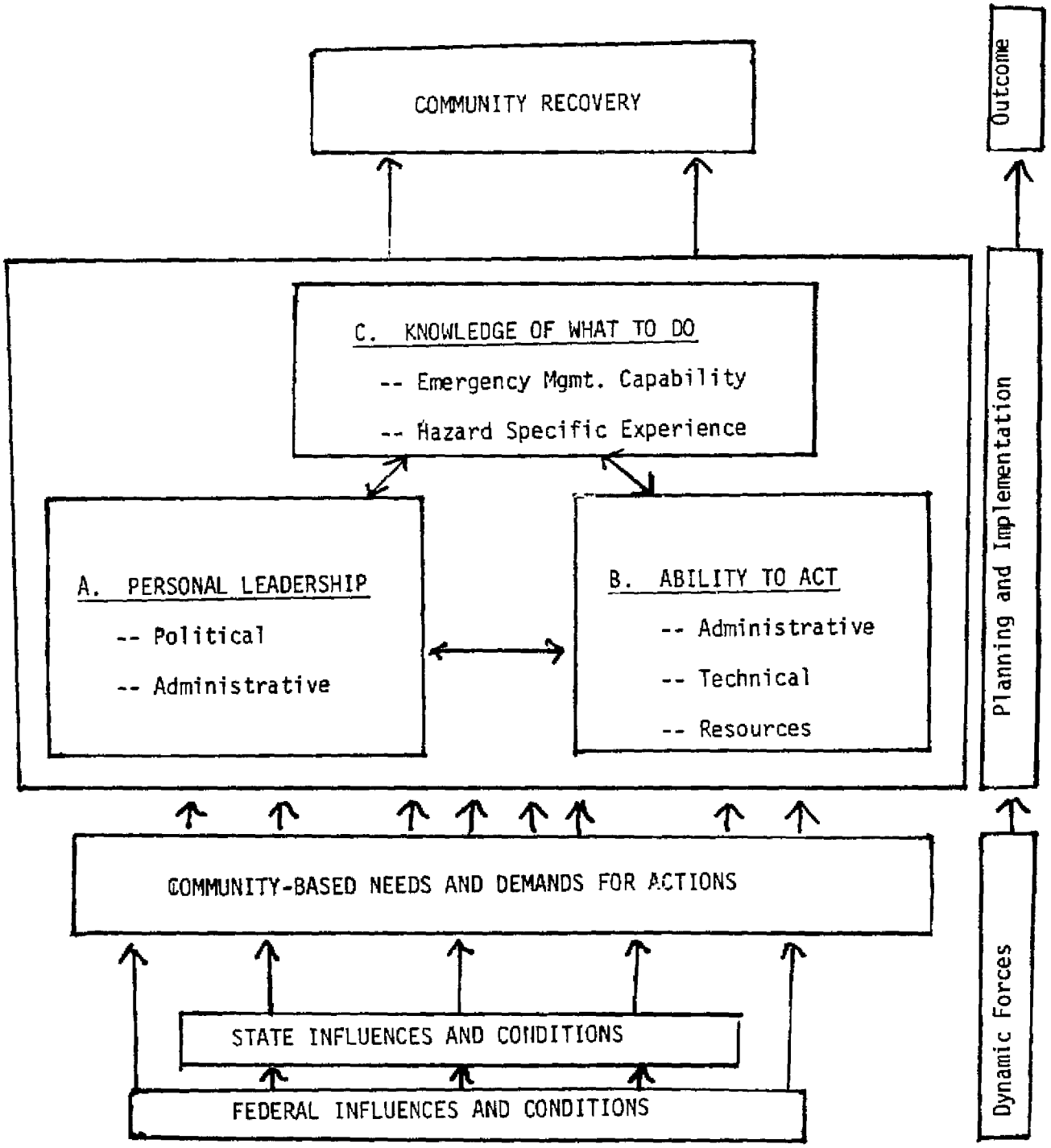
Intergovernmental and Interorganizational Context

After a major disaster--an event large and damaging enough to warrant receiving a Presidential Disaster Declaration--local officials quickly become involved in a complex web of intergovernmental relationships while making the public policy choices that affect the future of the community. In the last decade or so, the amount of federal assistance provided to local governments following disasters has increased, and with assistance comes increased interaction among officials at all levels of government. Because of the considerable involvement of other levels of government in a disaster that is

*This framework was inspired in part by a model described by Dennis Mileti in his recent work on organizational response to earthquake prediction (1983).

FIGURE II-1

ELEMENTS OF THE RECOVERY PROCESS



essentially a localized event, the quality of intergovernmental relations has a major influence on the efficiency of the local recovery.

Not only do intergovernmental relationships make recovery complex, but so do federal laws mandating certain tasks simultaneous with recovery. Recent federal policies and executive orders promote the integration or coordination of mitigation efforts with recovery. Other federal requirements, such as the 75% federal/25% local match for public assistance, require local governments to assume greater financial and administrative responsibilities for recovery actions. Consequently, the intergovernmental context provides both problems and opportunities for the exercise of local strategic choice. Local opinions of the intergovernmental context varied across the communities we studied. In only a few cases was there an overall favorable assessment (both of state and federal relationships).

Each of the communities studied was in an area that had received a Presidential Disaster Declaration. The processes set in motion by the declaration, the assistance programs triggered, and the applicable federal regulations (for example, the National Flood Insurance Program) established the administrative, political, and to some extent the economic context within which the recovery took place. Since local officials deal with a major disaster infrequently, they are relatively inexperienced compared with their counterparts in federal and state government. Research has shown that local officials tend to be less concerned over disasters as a public policy issue than actors at other governmental levels (Thomas, 1976). In virtually all of the cases studied, local, state, and federal officials tended to have differing and sometimes competing perceptions of 1) their roles in recovery, 2) their priorities during recovery, 3) the importance of postdisaster mitigation efforts, and 4) the proper location of recovery planning and

decision making. Indeed, the cases we studied exhibited the continuum of relation types from cooperative to antagonistic.

Local-State Context

Typically, state government has a set of specified responsibilities as a partner in the federal/state agreement signed after a Presidential Disaster Declaration. Among them is the responsibility for hazard mitigation activities in the affected area, known informally as the Section 406 (of the FEMA regulations) requirement. States also play an important role in the disbursement of Individual Assistance Program payments and in other special programs and assistance triggered by a Presidential Disaster Declaration. Under state law, various state agencies have authority to provide programmatic and financial assistance. Each state's laws, executive orders, and regulations specify gubernatorial and other state power regarding state assistance to localities (see Feigenbaum and Ford, 1984; National Governors' Association, 1978b). The state presence in a community is personified by the Governor's Authorized Representative, who works closely with the Federal Coordinating Office and others in the Disaster Assistance Center created immediately after a disaster is declared.

Relations with state government officials varied widely among the sites we studied. Generally, the negative assessments of state relations by local government officials stemmed from their perception of the state's inability to provide technical assistance or significant financial assistance. Additionally, the heavy local dependence on federal programs for funding led to a direct local/federal relationship, which was intensified when local officials wanted quick decisions and ready cash flow for major projects. Under such circumstances, the state often was perceived not only as a layer of government, but also one that does not yield substantial assistance.

Local-Federal Context

Federal disaster assistance is provided under the Disaster Relief Act of 1974, Public Law 93-288, which is implemented by the Federal Emergency Management Administration (FEMA) following a Presidential Declaration of a "major disaster." FEMA administers grants to the states from the President's Disaster Relief Fund, and directly coordinates disaster assistance functions of all federal agencies. Both assistance under Public Law 93-288 and payments by the National Flood Insurance Program (in flood disasters) are usually available, but each program has significant requirements that must be met by met by local officials.

In our study, we noticed that a certain amount of difficulty in federal/local interaction arose from local inexperience--for example, not knowing ahead of time the limitations of individual and public assistance. By comparison, familiarity in normal times with the intricacies of various program requirements--as well as benefits and limitations--paid off during the turmoil of the recovery phase for some of the communities studied. Great local displeasure was expressed in many cases over the requirement for local 25% fund match for public assistance, and over what local officials viewed as the complex and onerous administrative process for payment of the public projects described in the Damage Survey Reports (DSRs).

Even after receiving a Presidential Disaster Declaration and identifying available federal programs, a community still may have difficulty in obtaining federal aid to assist with reconstruction. Prior to 1973, many federal agencies had categorical grant programs available to localities after a serious disaster. Since then, however, the block grant and revenue sharing programs have left little discretionary federal funding available for long-range disaster

recovery.* This circumstance has contributed to less favorable local perceptions of the federal role in recovery.

Mitigation

Mitigation can be viewd as a sub-category of federal and state relations by local governments in that it means a diferent set of decision rules for local government, and it can have an effect on local choices. The need for mitigation plans may change the demand structure at the local level during the recovery period. For flood-related hazards, a special set of requirements exists for municipalities that participate in the National Flood Insurance Program. Implementing mitigative measures in the postdisaster period is often a complex exercise in intergovernmental relations.

The correlation between previous disaster experience and mitigative actions is not as clear as might be expected. For example, one community in our study with a history of frequent coastal storms has paid minimal attention to mitigation, while another community subject to less frequent coastal storms has taken a number of significant, mitigative steps. Neither was there a clear correlation between size of a community and attention to mitigation: the smallest community in our study continuously engages in mitigation planning, although it is dependent on external resources to implement necessary measures.

There are many determinants of whether significant mitigative measures will be taken. The locally determined presssures for (or against) mitigation should be considered part of the box in Figure II-1 marked "Community-based Needs and Demands for Action." Some of the determinants are as follows:

*A Digest of Disaster Assistance Programs, useful to state and local government officials in long range recovery and mitigation efforts, is available from FEMA.

- **Regional area**--the prevailing way of doing things and the extent of conservatism are two influences on the local public attitude and posture toward external organizations and other levels of government (especially federal).

- **Dependence vs. independence**--some localities, especially small ones, are very dependent on technical assistance or financial help from other levels of government and, apparently, will stay that way. Consequently, in times of an emergency, they rely heavily on state and federal assistance for a variety of needs. Others pride themselves on self-sufficiency or independence and do not want outside involvement (interference) in their affairs. Either of these characteristics carried to an extreme becomes a problem of its own for state and federal emergency services personnel. These attitudes of dependence or independence are not a function of resource availability only.

- **Perception**--perceptual or attitudinal characteristics affect a locality's inclination to mitigate hazards. Not everyone perceives the repetitive, cyclical nature of certain natural phenomena, or analyzes existing hazards and plans for mitigation of disasters likely to recur after one's term of office or lifetime ends. What constitutes mitigation, particularly knowledge of specific mitigation techniques and projects, is not clear to all decision makers. A local official may fully support the concept and process of recovery, but be unable to deal with mitigation because of perceived cost/benefit ratios for different mitigation options.

In the final analysis, when economic and development pressures outweigh the perceived benefits from mitigation, the former wins over the latter. Far more needs to be learned about the interaction of economic and development interests with other groups committed to mitigation at the local level.

Bridging the Gaps

To improve federal interagency cooperation after a disaster is declared, and to monitor mitigation activities, the Federal Interagency Hazard Mitigation Team (HMT) process was established in late 1980. After a presidentially declared flood disaster, the FEMA Regional Director appoints a team comprised of key federal agency representatives and representatives of state and local governments. An HMT may make recommendations, but it has neither enforcement nor regulatory powers.

The HMT usually functions as a regional, interagency, and intergovernmental team. The teams were designed to promote a comprehensive approach to flood hazard mitigation during the post-flood recovery process. An interagency agreement requires that the team prepare a report within 15 days of a Presidential Disaster Declaration, that the mitigation activities recommended in the report emphasize nonstructural measures, and that federal agencies conform their recovery actions to the recommendations in the report to the fullest extent practicable. The activities of teams, including preparing the report required 15 days after the declaration date, have had a significant effect on the identification and implementation of mitigative measures at the city and county levels soon after a major flood-related disaster.

The HMTs have had several secondary benefits, one of which has been to improve federal/state/local relations through the participation of state and local representatives in all HMTs. The second benefit is the prompt attention brought to bear by the 15-day deadline for the first report; the HMT process fosters a sense of immediacy for mitigation measures early in the recovery period. A third benefit is that the HMT process has led to the formation of a small cadre of experts on recovery and mitigation among the federal agencies usually involved in the aftermath of a local disaster. For example, in California, state officials have developed their own, informal interagency team. In all cases in this study at which an HMT was present, greater local interest and emphasis on flood hazard mitigation was obvious.

Generally, public officials at all levels comment favorably on the HMT process. They consider it useful and effective because it encourages decision makers to pay prompt attention to mitigation during recovery. Local officials appreciated professional attention at an early date; state officials valued the formal mechanism through which

they can participate in mitigation planning; federal officials (other than FEMA officials) became better informed about disaster needs and programs, and hence, were more effective in delivering needed programs and services.

Three Elements of Community Recovery

In the center of Figure II-1 are the three elements over which local officials have the most control. Local officials can affect community recovery directly through these categories of mode and action: leadership, ability to act, and knowledge. These three characteristics are in every community to some extent, can be manipulated (i.e., increased, decreased, purchased, hired, learned), interact with each other in predictable ways, have an impact on the recovery process, and can be affected by local demands for actions. It is not necessary to wait until **after** a disaster occurs, however; many steps to improve community capacity for efficient recovery should be taken **before** disaster strikes.

It is important to recognize that all three components appear to be necessary to ensure efficient community recovery--efficiency here meaning greater speed and less cost in terms of personnel and material assistance. Leadership is an essential and almost sufficient condition of efficient recovery; ability to act must be paired with leadership to ensure an expeditious recovery; and knowledge of what to do is not essential initially, but can be extremely helpful once acquired.

The above three conditions are combined with "demand" parameters (at local, state and federal levels) in an interactive fashion in Figure II-1. The framework can be used to encourage public officials to evaluate their communities regarding specific kinds of leadership, resources, and knowledge prior to a disaster. In addition, it can be

used by state and federal officials to predict how easy or difficult a local recovery process is likely to be. If one or more key ingredients for an expeditious local recovery appear to be missing, then state or federal officials can take steps to supply it or aid the locality in acquiring it.

While the organizing framework appears to indicate a one-way process, in actuality the interactions are more cyclical. Under certain conditions, such as experience with the same disaster agent, local officials may be able to influence some of the dynamic factors outside their normal zone of control. For example, Fort Wayne officials (who knew about flood fighting) were having extreme cash flow pressures, but were able to negotiate a special audit procedure with FEMA so they could proceed more quickly to receive federal reimbursements for local payout. Experienced and aggressive local leaders have, in fact, affected many of the external agents (state, federal, private). After extremely large and highly destructive events, such as Hurricane Camille (1969) and Hurricane Agnes (1972), many changes in federal laws, regulations, and policies were made in response to problems and complaints expressed by local and state officials about the federal disaster assistance programs and processes in effect at that time.

Leadership

Leadership is a much-studied field, from studies of presidential leadership to city governance. This report discusses what has been learned about leadership as it is formally and informally exercised in the field of emergency management.

More than a decade ago, Quarantelli and Dynes (1972) documented their perceptions of local public leadership and organization for disasters. Their observations are worth reviewing with respect to the local disaster recovery process:

> Patterns of leadership and of authority in disaster-impacted communities are very complex. Their complexity, however, is usually misinterpreted as confusion and the panacea of strong leadership is frequently offered as a solution without understanding the nature of the problem. Perhaps the beginning of understanding is to start with the observation that almost all communities are not organized to cope with disasters. This is true even in localities with extensive pre-disaster planning since there is a considerable difference in anticipating problems and facing them. What disasters do is to create a series of new problems for the community and in doing this, they necessitate new relationships among its parts. Disasters force the development of a new structure which reflects the current involvement of various parts of the community which, in turn, can make decisions for the community.
>
> The scope and complexity of involvement in disaster undercuts the possibilities of centralizing authority to a much greater extent than those possibilities exist even in the pre-disaster patterns of American communities.
>
> The [emerging] structure, therefore, reflects the social realities of the situation rather than an artificial creation based on unrealistic notions of controlling and commanding the situation. Authority has to be earned, not imposed, and those who wish to impose it will seldom earn it. It is earned by those whose performance shows that they deserve it and it seldom comes to those who just claim it (pp. 29-30).

More recently, Kartez (1984) studied the response of 26 local governments after the 1980 ash eruption of Mount St. Helens. His observations about local response also reflect emergent or "adaptive" relationships to deal with the emergency situation:

> In their immediate responses, virtually all jurisdictions relied on existing functional lines of organization in public works, safety, and management departments, rather than the county-wide emergency and civil defnse offices encouraged by state and federal programs.
>
> About half reported no use whatsoever of a countywide, multijurisdictional plan, which is the usual centerpiece for state and federally funded preparedness programs (p. 10).

Since the traditional, institutional arrangements for use in emergencies were not used or were not useful, many local officials used "adaptive strategies" in responding to the disaster:

> Local governments learned their way into these strategies during the heat of emergency, however, through a process that compressed problem recognition, experimentation,

> evaluation, and implementation into less than a week. The process took place outside the institutional context in which emergency planning is organized under state and federal mandates. The local process of compact learning can be interpreted as a strong lesson in the behavior of institutions under stress. The result was a form of rapid social learning among local personnel who realized the limitations of such institutions and conseuently altered their own management behavior (p. 17).

Addressing the intergovernmental aspect of the observed responses to the ashfall in the communities, Kartez states:

> . . . The observations made of the local response to the eruption of Mount St. Helens suggest that current intergovernmental programs for preparedness planning are encouraging a two-tier system of plans. The first tier consists of the federally mandated nuclear response plans, which support the countywide planning and coordination model. The second tier comprises local procedures that develop out of adaptation to each jurisdiction's experience, potentials, and constraints. The first tier embodies an administrative view of the world; the second a cognitive view based on social learning. Learning about workable techniques and organizational approaches took place on the second level (p. 17).

The two studies above address the response and short-term recovery phases primarily; however, in the long-term recovery process, the need for site-specific, adaptive planning strategies is at least equally strong. Our observations were that the recovery planning process is virtually all second-tier decision making. We noted two aspects of leadership: 1) the presence of leadership itself (and the importance of it), and 2) the exercise of leadership (what was done and what resulted).

We observed that certain leadership characteristics facilitate recovery; among them are:

1) flexible, creative styles of problem solving and decision making (i.e., styles that allow for ad hoc behavior rather than a "by-the-book" mentality);

2) a vision of what the community could and should be like;

3) an ability to attract and motivate competent assistants; and

4) strong links to other decision makers, both in the public and private sectors.

The strong linkages usually result from frequent communication, networking, and constituency building. Effective local leaders use their networks of contacts; build support for preferred courses of action; and create linkages with county, state, and federal officials as well as with business persons and others who can assist with recovery.

We also observed that leadership is not necessarily a quality that comes with an office or position. Leadership can be exercised by someone elected or appointed; by someone well-established or newly emergent; or by a mayor, a city manager, a consultant, a city council member, a concerned citizen, or a business person. Further, leadership is not an element that is always limited to one person per disaster; the leadership characteristics important to recovery can be found in several individuals, each having a different role or set of responsibilities. For example, an effective local leader will stay in close contact with major business and civic leaders and include them in the key committees or task forces that make recovery decisions.

Another characteristic of capable leadership is the ability to forge new relationships--with other local or county agencies, with the state, with federal agencies, and with private sector leaders. For example, the part-time mayor of the small town of Cardington, Ohio, managed to create a strong tie with the state agencies that was the basis for a remarkable recovery in the small city devastated by a tornado. Similarly, leaders in the small city of Coalinga--an independent, rural community--worked more closely and successfully with Fresno County officials during the post-earthquake period than at any previous time.

In communities where recovery was observed to progress rapidly and competently, community leaders exhibited vision. That is to say, they had a concept not only of what their community was at the time of the disaster, but also of what it should and could be in the future. When major systems and numerous structures in a community have been destroyed, local leaders that have an idea of what the community **will be** can better set goals for recovery and speed it along.

We use the term "vision" to describe the ability to look ahead, make long-range plans, and gain consensus on adopting and implementing those plans. According to Kiechel (1985, p. 127), "A good chief executive has the ability to cast his [her] mind forward to encompass the next ten or more years."

Another hallmark of effective local public leaders is that they tune into what constituents want, and neither overestimate nor underestimate the extent of the effort desired by the community. Finally, the effective leader turns adversity into opportunity. Some of the local leaders we observed saw the disaster as an opportunity to implement plans that previously may have only been "pipe dreams." A disaster may provide an opportunity to those who are assertive **and** know where they want to go with their community's development.

Ability to Act

Administrative capability, technical knowledge, and resources (material and financial) determine the ability to carry out recovery over the long term. While leadership provides direction and motivation, the three sorts of resources enable the work to be done. Administrative capability refers to competent local public administrators, a smoothly functioning administrative system, and adequate methods of monitoring and record keeping. Technical knowledge involves land use controls, enabling legislation for needed authorities to manage recovery

activities, mutual aid agreements, and urban development plans and maps. Tangible resources include grant money, money from local taxes, municipal supplies, and equipment. Administrative resources have to do with personnel and financial management, material resources, and record keeping and other documentation. Technical resources include physical planning and mapping capability; geologic, hydrologic, and analysis capability; land use controls (zoning, building codes, construction standards, subdivision requirements); enabling legislation (emergency authorities); and technical aspects of emergency preparedness (emergency operating center).

Less tangible and harder to measure is local public capacity, which is the broader term for ability to act at the local level. Many volumes have been written on this subject, although virtually no attention has been paid to emergency and disaster settings (cf. McGowan and Stevens, 1983; Warren and Aronson, 1981; Mead, 1979).

Some or all of the resources mentioned above exist at all levels of government; consequently, one task of local officials (preferably, prior to a disaster) is to position the resources they **do** have effectively. For example, there should be current inventories of supplies and equipment likely to be needed, lists of organizations with earth-moving equipment and four-wheel drive vehicles, and good methods of keeping detailed records on the need for major capital projects and of documenting expense connected with works projects. In addition, municipal officials should be working to enact enabling legislation for declaring and coping with an emergency or disaster. After the disaster, they should be prepared to obtain and use resources available from external sources. For instance, it is possible to borrow, buy, or otherwise acquire a specific competence if it is not present in existing

personnel. The importance of identifying and using outside resources is addressed more in later chapters.

Knowledge

The final element in the model is knowledge of emergency management in general, and hazard-specific knowledge in particular. Recovery proceeds more smoothly when the local officials know **in advance**

1) what federal and state programs exist for the benefit of public and private sector disaster victims;

2) what external resources are available;

3) how to apply for a Presidential Disaster Declaration; and

4) how a community applies for grants.

After a major disaster, local officials are usually barraged with demands for assistance and services from individuals, existing groups, and newly emergent groups. When many sets of demands coalesce, that coalition may generate enough force to achieve the action desired. On the other hand, competing forces can cancel each other out, moderate pressure for a wide array of actions may not provide enough impetus for one action. Finally, significant pressure for no action, e.g., no mitigative action on a barrier island slated for residential development, may result in a laissez-faire outcome (cf. Hawley and Wirt, 1968; Wolensky, 1985). This then is the local context in which local leadership operates.

Leadership, resources, and knowledge can be influenced by community-based demands for action, and many outcomes are possible. Residents of different communities have varying expectations and preferences and, therefore, differing standards of what is acceptable in terms of leadership or of administrative capability. For example, in Marin County, where the socioeconomic status is probably higher than in any of the other communities studied, local residents had very high

levels of expectation from their elected and administrative officials. They pay high taxes, and generally they expect high performance from their public officials. More importantly, they elect and appoint officials capable of meeting their standards. After the 1983 disaster in Marin County, citizen groups pressured the county not only for recovery actions, but for improved emergency preparedness. Federal and state officials also made their requirements and recommendations known in the postdisaster period, particularly via the federal Interagency Hazard Mitigation Team process. However, what stood out in Marin was the well-articulated and consistent community-based pressures for action and improvements regarding emergency management. This appears to have contributed to the notable competence Marin County showed in its recovery efforts. It is unfortunate that these conditions occur so infrequently.

Leaders can shape the recovery agenda, but their actions ultimately reflect some prevailing or dominant point of view in the community. An effective local leader neither overstates nor underestimates the will of the community's citizens. Most importnt, he/she responds promptly and effectively to reasonable community requests.

The knowledge of what to do during and after a major disaster can be gotten through experience, learned, or hired. Since the first year of our field studies, we have noticed that experience is disproportionately influential. We noted that prior experience with the same or similar disaster agent usually means that local capability is higher; organizational arrangements and coordination are in place; and seasoned local leaders are familiar with the Presidential Disaster Declaration process and resulting activities. In addition, we found that prior disaster experience tends to lead to learning and to application of mitigation measures. The earlier experience(s) provided

opportunities for local officials to meet the key decision makers at other governmental levels, and such contacts became very useful the next time outside assistance was needed. However, it is also true that in the absence of experience, there are ample chances to learn about recovery. Additionally, local officials must realize that they can retain the services of people who have both experience and knowledge.

Regarding the interaction among the three elements, several case-specific examples will be provided in the following chapters. We think that strong leadership contributes to a high level of available resources because strong leaders work to get such resources. We also think that "knowledge" acquired prior to a disaster may encourage a community to upgrade its resources. Finally, strong leadership makes the acquisition of hazard-specific knowledge relatively easy because the important links to the proper external agents and essential organizations have already been established. As depicted in the framework, these dynamics pertain to communities of all sizes, and hold true for different disaster agents.

CHAPTER III

HOW THE RECOVERY ACTUALLY HAPPENS*

This Chapter explains how the elements and forces depicted in the recovery framework in Figure III-1 interact to produce an outcome. Using specific community examples, the key elements identified in the previous Chapter will be elucidated and expanded. In addition, the tradeoffs made during the recovery period to implement major mitigation measures will be discussed.

It may be, as some recent research has reported, that community level recovery per se is virtually a given, except after the most catastrophic of events (see Friesema **et al.**, 1979; Wright **et al.**, 1979). Even so, the speed and quality of recovery for communities are major policy issues. To improve the speed and quality of recovery, local officials must find ways to 1) compete for scarce resources, 2) ensure more productive intergovernmental relationships in postdisaster recovery, and 3) better manage community-level decision making. With the diminishing level of external assistance that can be provided to any disaster-stricken community, a number of local officials in cases we studied systematically developed and exercised strategic choices to produce expeditious recovery and promote long-term mitigation (cf. Friend and Jessup, 1969; Mikulecky, 1980).

The characteristics and actions found in the recovery processes of the 14 study jurisdictions have been organized around the three community elements described in Chapter II--leadership, ability to act, and knowledge. Those elements are affected by contextual factors, most

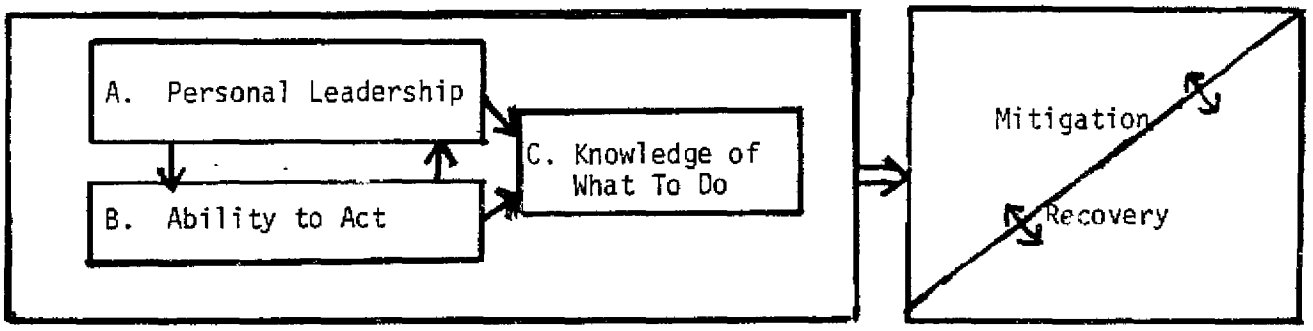
*Some of the material in this chapter was included in "Disaster Recovery and Hazard Mitigation: Bridging the Intergovernmental Gap." Claire B. Rubin and Daniel G. Barbee. Public Administration Review, December, 1984.

FIGURE III-1

STRATEGIC CHOICES FOR GUIDING LOCAL RECOVERY

Locally Driven Choices and Characteristics

Recovery and Mitigation Proportions and Outcomes



notably state and federal influences and requirements, which are beyond local control for the most part. However, an emerging set of locally determined strategic choices can guide local recovery (see Petak and Atkisson, 1982).

It should be noted that the presence of each of the three elements is a necessary but not sufficient condition for recovery. Over the past four years, we have observed that these three elements collectively contribute positively to recovery. We have not been able to discern a deterministic model, but it is apparent that varying degrees of element presence leads to differential outcomes. We can state with some certainty that if element (A) is in place, there is a predisposition to exert pressure on element (B) which, in turn, leads to the acquisition of element (C).

Personal Leadership

An effective recovery results from local officials' abilities to uphold community values, and protect or expand the community's economic base. Upholding community values in the postdisaster setting was observed to be a difficult task. For example, in Coalinga during the recovery period there was a split between two politically active factions, each holding to and advocating a different image of the community's future. One faction was prochange, the other favored the status quo (see Petak and Atkisson, 1982; National Science Foundation, 1980). Until a prevailing agenda for the community emerged, both the quality and the speed of recovery were affected. Prior to the disaster the community lacked a set of agreed-upon goals, a comprehensive redevelopment plan, and adequate land use and building code ordinances, so the needs for these and other planning and development tools contributed to delays in the recovery process.

In several other cases, officials quickly assessed the community's values and found ways to develop organizations to advocate them or procedures to protect them. In Fort Wayne, a policy-level neighborhood advocacy unit was launched as part of the recovery effort almost before the flood waters subsided. The administration of external private assistance and some federal assistance for individuals was coordinated with the neighborhood service unit. This coordination accelerated the distribution of assistance and made the local government appear more responsive to its citizens' needs. The same community quickly undertook a major recovery planning initiative, which representatives of other levels of government were compelled to consider. The result was an increased role for the community officials in intergovernmental coordination of the recovery process. More than half of the communities we studied organized less ambitious but similar ad hoc organizations; the effects of all were to increase the local influence over recovery, make it more consistent with community values, and expedite recoveries.

Protecting the community's economic base is a major reason to act quickly if the base is threatened (see Foster, 1980; Sutphen, 1983). Disaster recovery and economic development activities have many parallels, but when community policy makers explicitly decide to integrate the two, the situation becomes complex. Examples with a positive outcome include Fort Wayne and Estes Park; one with a negative outcome (development with no disaster mitigation involved) was Corpus Christi.

We found that communities with leaders that have a vision of the community's long-range economic development can be expected to fare better during recovery. Such communities usually have set goals and achieved consensus for them, made plans for modernization and change, have a network of interested persons, and have taken such preliminary

steps as forming an urban renewal authority. In contrast, communities recover more slowly that are in a slow growth or declining phase of their life cycle without action plans for development.

In Salt Lake City, Fort Wayne, and Estes Park, the speed of recovery, and to a lesser degree its quality, was enhanced by the local government's efforts to be responsive to businesses and to protect the existing economic base. Fort Wayne hired an industrial development professional to assist in attracting new businesses. Estes Park responded promptly and favorably to a private business group interested in promoting and developing the economic base of the area; an urban renewal authority was quickly created to lead the revitalization of the central business district.

Another important finding from the case studies is that local officials knowledgeable not only about disaster assistance programs, but also major community and economic development programs have more strategic options and are thus more able to obtain intergovernmental assistance.

Ability to Act

The development and use of a strategic approach to recovery reflects the local government's ability to act. Several of the communities studied rate very low in the categories of technical capability, resources, and organizational flexibility and adaptiveness. In the small mountain community of Grundy, where the local economy is based on coal mining, the combination of a lack of local technical knowledge and resources, lack of flexibility (for undertaking nonstructural mitigation), and a history of chronic flooding limited the town's ability to act to change things. The town's effort to obtain technical capability and other resources needed to recover

from its latest disaster was neither expeditious nor high in quality. Now this town is very dependent on externally supplied technical assistance and resources. When it has another major flood, it can be expected to recover even more slowly and painfully than was true the last time.

In contrast, the city of Fort Wayne displayed a significantly greater ability **and willingness** to act and to utilize all technical capabilities and local resources following its last major flood. For instance, the city was able to assess the federal assistance available to it, and then effectively assign top-level policy and technical personnel. Flexibility, adaptiveness, and creative leadership were key characteristics of Fort Wayne's recovery efforts. In addition, the city created its own local equivalent of the federal Coordinating Officer and federal Interagency Hazard Mitigation Team. The strategic choices made by local officials greatly enhanced the coordination among governmental officials and substantially shortened Fort Wayne's recovery period.

The other dozen cases fall between these two, with the ability to act generally conforming to the level of technical and administrative competence of the local government and resources available during normal times. In a few cases, such as Cardington, Ohio, it appears that a strategic political choice to develop a strong local-state relationship made up for relatively low local ability to act. We suspect that in places like Cardington, where an unusual set of ad hoc actions lead to reasonably effective recovery following one disaster, there may not be the same positive outcome after another disaster.

Knowledge of What To Do

In the 14 cases studied, local and other leaders varied widely in their disaster experience and knowledge. Generally, experience affects

strategic choices in two ways. First, experienced local officials tend to be more adept at short-term recovery management and the related administrative tasks such as documenting damages and disaster-related local expenditures. In cases of chronic and frequent flooding, for example, administrative arrangements were readily changed to meet the specific needs of short-term recovery.

Second, the case studies show that experience may expedite recovery from a second disaster caused by the same agent. However, frequent experience with only one disaster agent may reduce the community's willingness to develop longer-term recovery strategies that include relatively new or innovative mitigation efforts. Externally developed policies and programs, such as the National Flood Insurance Program (NFIP) and the Interagency Hazard Mitigation Teams, may expand or improve mitigation choices. Nevertheless, significant in many of the locations we studied was the strength of economic interests working against certain types of mitigation efforts, frequently nonstructural flood hazard mitigation measures.

The strategic importance of local officials' access to and utilization of recovery and mitigation information is demonstrated in several of the cases. Following the flood in Estes Park, the community hired a former FEMA official as its Disaster Recovery Manager, thereby obtaining a wealth of information and knowledge about recovery and mitigation assistance sources. In Paris, Texas, following a devastating tornado, immediate recovery information came from officials of Wichita Falls, who had recent tornado recovery experience. One of the major instrumentalities of the recovery effort, Interfaith, Inc., was recommended by a Wichita Falls representative.

Long-term recovery and mitigation information often is provided by the Hazard Mitigation Teams, other organizations such as county or state

officials, and individuals such as a consultant or contractor. Fort Wayne was able to obtin needed information by hiring an experienced professional grant writer. While there are advantages to having local public staffers with disaster recovery and mitigation knowledge, the lack of in-house experience and information can be offset by use of outside experts.

Political awareness and astuteness are factors that proved difficult to identify and isolate, but they may be the most critical ones for local officials. In those communities where the strategic choices were more acceptable to the various community interests, it was because the recovery/mitigation tradeoffs, costs, and benefits had been made known to citizens and business owners at the beginning of the recovery effort. In addition, local public leaders displayed political savvy in presenting and implementing the options selected by the community.

In Fort Wayne, a political choice was made to identify the mitigation and recovery values; they were included in the 14-item list of options. Explicit consideration of the different options gave Fort Wayne officials added leverage in negotiations with state and federal officials for recovery and mitigation assistance.

Officials in Salt Lake City took a calculated chance when they used city streets as flood channels to avert damage to downtown commercial and other structures during the heavy snowmelt and flooding in the spring of 1983. They estimate that by using streets as canals about $100 million in damages to private property were avoided. This strategic choice--which was carefully weighed by local officials--accelerated recovery and clearly protected community economic values.

As in Fort Wayne, Salt Lake City officials made strategic choices regarding the balancing of recovery and mitigation investments. These

cases suggest that in most postdisaster settings, both types of investments will be made; however, the tradeoffs between recovery from the present disaster and protecting the community from the next event are important to consider. The **strategic** determination of the tradeoff is politically important, but we think quite rare. To make this choice--one that enhances the long-term future security of the community--requires astute political and administrative leadership. The study of communities that recovered most expeditiously suggests that the commitment to mitigation is a sound one, particularly for communities chronically at risk.

Guiding recovery the basis of a future image of the community rather than simply of near-term expediency appears to produce better long-term results. That it also appears to be politically costly for local leaders suggests that local leaders need help in guiding community recovery and mitigation, and a careful examination of state and federal policies and programs is warranted in order to be sure they help, not hinder, effective local recovery.

CHAPTER IV

CONTRIBUTIONS TO EFFECTIVE RECOVERY

After our observations of the lessons the communities learned the hard way, it is possible to offer some "actionable propositions" to local public officials who have not (yet) had first-hand experience with a major disaster. Using the three key elements in the model presented earlier in Figure II-1 as categories, we cast our findings in the form of what we hope are useful pointers.

Most important for readers with responsibility for emergency management is to understand the controllable and non-controllable factors in disaster recovery. In Figure II-1 there are three components that local officials can do something about: personal leadership, ability to act, and knowledge. The dynamic forces (the state, local and federal demands for action) are the contextual factors over which one usually cannot exert direct control. However, some forces are predictable, as for example, the federal requirements attendant with a Presidential Disaster Declaration. They are, for the most part, the same for all communities and do not change over the course of the recovery period.

In this chapter, we will describe each of the major elements needed for recovery, report on our findings after visiting 14 recovering communities, and note as propositions what we have discerned from the actual disaster experiences of comunities and their leaders.

Personal Leadership

As we noted earlier, certain characteristics of good leadership facilitate recovery, for instance, flexible, creative styles of problem-solving and decision making. The style that allows for ad hoc behavior (also known as adaptive behavior or emergent leadership), as contrasted

with a "by the book" mentality, is more effective in managing the recovery process.

Leadership Proposition #1

Decide soon after a major disaster what you want to do and who you want to participate in the planning and implementation of the recovery.

Local public officials who were clear about how they wanted to recover, who they wanted to help plan and implement the recovery, and what mitigation measures they preferred to adapt during the recovery, fared best. The Chief Administrative Officer or his designee assumed a strong leadership role during the recovery in Marin County, Phoenix, and Estes Park; similarly, the Chief Executive Officer assumed a lead position in Salt Lake City, Fort Wayne, and Cardington. In all of those places, recovery was relatively expeditious.

Some of the recovering communities observed would have benefited from making the aforementioned decisions early in the recovery period and then acting upon them. Among those that did not decide what to do or organize as promptly as they might have were Hull, Scituate, and Coalinga.

Soon after the disaster, determine if you and existing local staff have the requisite skills and the time to deal with federal officials and public assistance program requirements. Keep in mind that many routine activities must be continued during the recovery period. If the necessary skills and staff time are not available, move quickly to acquire assistance. Some advice follows based on the experience of several recovering communities:

- You may be able to use the staff at another level of government. Cardington, Ohio, a small town devastated by a tornado, was able to get considerable assistance from the State Office of Economic Development.
- You may want to hire an outside consultant. Estes Park, a resort town struck by a huge flood during the peak of its

tourist season, hired an experienced person, a former FEMA official, to be the local disaster recovery manager.

- You may want to revise the scope of work for an existing consultant. In Fort Wayne, Indiana, the mayor used a consultant who had disaster recovery experience but was on board for another project, reassigning him to flood recovery planning.

It has been noted by many researchers that after a major disaster, local government is confronted with a tremendous overload of decision making and administrative work. The demands for local public leadership usually far outstrip the number of persons and capabilities available. It is essential to perform a prompt, realistic assessment of capacity and, if it is necessary to augment it, move quickly to do so.

Leadership Proposition #2

Since the quality of intergovernmental relations is of paramount importance to efficient recovery, it is necessary to attend to the many intergovernmental activities entailed in recovery promptly and efficiently after a major disaster.

The intergovernmental process is one that must be understood and appreciated by local leadership early in the postdisaster period, and then implemented by both executive and administrative staff. In essence, both leadership and ability to act are involved. A local government's relation with state and federal emergency management officials tends to be fraught with tension and friction after a major catastrophe. Emotions run high, and reason does not always prevail when local public officials are highly stressed.

The ability to understand and comply with the rules, procedures, and documentation required under a Presidential Disaster Declaration is a rare talent. Usually few persons at the local level have the talent, but both federal and state officials have more experience with the intricacies of this special arena of public administration. Maintaining federally acceptable records and managing the cash flow in the municipal budget can facilitate a community's recovery.

In the localities that recovered most successfully, local officials began immediately after the disaster to work closely with their governor and congressional representative, as well as with state and federal emergency management officials. A comprehensive approach, involving all levels of government, worked best. It is difficult to think about long-term recovery while response activities are still going on, but it is essential to do so. Effective execution of intergovernmental programs during the recovery period was especially high in Estes Park, Marin County, Phoenix, and Cardington. In the smaller communities of Coalinga and Cardington, the county and state, respectively, served as important allies and intermediaries that assisted municipalities in their dealings with higher levels of government.

Lack of an effective intergovernmental process slowed down the recovery process in Hull and Santa Cruz County. Initially, Santa Cruz County's recovery was troubled by intergovernmental problems, which included city/county problems as well as protracted county/federal disagreements. Santa Cruz County had, however, showed significant progress on many fronts when the team visited the second time, more than two years after the disaster.

Leadership Proposition #3

If you view a heavily damaged area as a site for "instant urban renewal," a broader perspective and a wider array of reconstruction options will be maintained during the recovery planning process.

In an area newly cleared of existing structures, there may be opportunities to change land uses or to rebuild safer higher quality structures. In Estes Park, Colorado, shortly after the flood, a local business organization succeeded in enacting a long-simmering plan for a local urban renewal authority. That authority was involved in the recovery decision making for the badly damaged central business

district. Consequently, the business district reconstruction had a longer-term frame of reference and included several mitigation measures. Similarly, in Coalinga, a redevelopment agency was instituted to help restore the downtown area. When asked about plans for the redevelopment of the downtown area, the city manager commented:

> Well, fortunately, I have been here so long that I have many times thought about how we could redevelop. Actually, no matter what I think, unless the property owners and the merchants and land-owners can sort out what could be done.[sic] I have often thought that when you are developing something, the first technique is to find as many alternatives as you can, then you start discarding (California Seismic Safety Commission, 1983).

However, if the local public leaders linger too long over a "grand plan," some property owners may make their own decisions and rebuild as they please. After a disastrous tornado struck Xenia, Ohio, in 1974, lengthy discussions and elaborate plans for renewal of the central business district ultimately contributed to the failure of the proposed urban renewal plan. In Cardington, the lengthy planning process for a revitalized business center took longer than most business owners cared to wait. They proceeded to rebuild without waiting for the plan to be finished.

Tremendous pressures are at work locally to restore everything quickly to its condition before the disaster. However, few neighborhoods are perfect, and settlement patterns, siting of commercial establishments, and road systems usually can be more efficient, or simply better. Further, to allow existing land uses and structures to "snap back" exactly as they were before the disaster may leave them equally vulnerable to the same or other hazards in the future. Community betterment should be factored into the recovery process, but betterment plans must be decided upon quickly.

In reviewing the 14 recovering communities, it is difficult to generalize about how they approached reconstruction because not all of the communities suffered high impact in one small area or in one sector (for example, commercial). In Marin County, the land- and mudslides were scattered widely in a large geographic area. Those communities in which the brunt of the damage was in the central business district (Coalinga, Cardington, Estes Park) had a focal point for recovery planning. Each of those places also sustained scattered residential damage, but one sector was the primary focus.

A broader approach than just "put it back" was used in Estes Park, Phoenix, Coalinga, Fort Wayne, and Salt Lake City. Other communities either did not make any changes or preferred the laissez-faire approach. In Corpus Christi, for example, few opportunities to mitigate against future hurricane damage were taken in either North Beach or Padre Island.

Leadership Proposition #4

At the community level, vision of what the community could and should be after the disaster is an important attribute of effective leadership.

Whenever the top elected or appointed local officials (or private sector leaders willing to accept public office) exhibited foresight about the future of the community, goal-setting and progress toward those goals were facilitated. Relatively few local leaders were able to combine the ability to assess the community's values and desires with their own foresight to provide effective leadership during the recovery period. Yet several dramatic examples were noted, e.g., the mayors of Salt Lake City, Cardington, and Fort Wayne.

Leadership Proposition #5

When strong, capable leadership is present, it increases the likelihood of getting more resources for repairing the damaged systems and structures in the community.

Municipalities or counties that are well managed in normal times, such as Marin County, Phoenix, and Estes Park, are more likely than not to rise to the special demands of disaster recovery. Places that were struggling or muddling along (such as Hull) were very much at a disadvantage when they had to cope with massive demands for services, funds, and other resources. Further, when strong leadership is present, a community is more likely to have adequate emergency management and disaster specific knowledge.

Ability to Act

Management capacity is a dynamic process; we are referring to it as ability to act.

Ability to Act Proposition #1

The resources of the federal government are critical to a successful recovery after a major natural disaster.

In most cases of successful recovery, the state or federal government played an essential role in marshalling the resources necessary for local recovery. Such resources are usually managed at the local level but they originate elsewhere. While it is useful to have state assistance, it is not essential to local recovery. However, no local government by itself has been able to make an expeditious and effective recovery from a major natural disaster.

Three communities stand out in their ability to obtain and utilize federal assistance: Estes Park, Grundy, and Fort Wayne. Marin County also was effective in seeking and obtaining federal assistance. It is interesting to note that the three top achievers here are relatively small communities. Only one place of the 14 studied--Cardington, Ohio--had a very close and highly productive relationship with the state. Two other communities, Phoenix and Salt Lake City, worked compatibly with the state officials in overcoming one or more major local problems. A

few communities viewed the state only as an additional layer of bureaucracy to go through.

Ability to Act Proposition #2

While some dependence on external resources is to be expected after a disaster, a heavy dependency on external resources (financial as well as specialized personnel) can cause a loss of local control and long delays.

Small to medium-size communities that have sustained a high ratio of damage to existing structures and systems are most likely to become dependent on state and federal resources. However, by effectively asserting local leadership and organizing its administrative capability, a small community can maximize its control over its recovery and its future.

Ability to Act Proposition #3

Local administrative and technical mechanisms, as well as resources, available before the disaster usually contribute significantly to an expeditious recovery effort.

Examples administrative mechanisms include land use controls; building codes, inspection and enforcement procedures; mutual aid pacts; and standard contracting agreements. Technical mechanisms include maps, and known zones of high hazards (for example, flood, landslide, storm surge). In other words, a certain amount of general administrative and organizational preparedness will be of use even if a totally unexpected disaster should occur. If a northeastern United States community were to be hit by a tornado, a relatively rare event for that locale, the availability of good local maps would aid in siting temporary housing in areas not subject to flooding or other hazards, in addition to being useful for the primary purpose of planning redevelopment. In Marin County, emergency exercises were oriented to an earthquake, thought to be the most likely event, but that preparedness paid off for a series of flood-induced mudslides and landslides.

Ability to Act Proposition #4

There is great need for careful documentation of all disaster-related expenses and management of records regarding local damages and expenditures that are disaster-related.

Keep receipts and records for all disaster-related expenses. Keep photographic and other records of damaged public infrastructure. A subsequent disaster may "change the landscape," making evidence of an eligible project a thing of the past. Damage Survey Reports (DSRs) are usually a major bone of contention between local and federal officials. In short, good records are required by the federal agencies, and those records ultimately are the basis for obtaining money for recovery projects and programs.

Ability to Act Proposition #5

Administrative staff can call emergency management issues and needs to the attention of local public leaders.

Marin County offers an interesting example of staff contributions to the county's ability to act: an active, aggressive county emergency management director initiated preparedness planning and regular exercises; he received support and reinforcement for these activities from the county manager; and together they led the way for the county to acquire knowledge and capability for response and recovery.

Ability to Act Proposition #6

Although a city and a county may each possess emergency management capability, unless they have worked out effective coordination with each other, they may not be able to respond to and recover from a widespread disaster.

In 1983, the weakness in county emergency management capability and the lack of city/county coordination in Salt Lake City and County were problems. They were overcome to some extent during the flood-fighting period by ad hoc response and recovery actions. Our research team observed that a more permanent organizational arrangement would be needed for the anticipated snow melt and runoff expected in the spring

of 1984 and in subsequent years. In fact, closer coordination was worked out in early 1984, and the flood fight in the late spring of 1984 went much smoother than it had the year before.

When Santa Cruz County experienced a series of floods, massive landslides and mudslides in 1982, the county emergency management organization was not prepared. It had not established plans for coordination with its municipal counterparts in the event of a diaster. In the subsequent two years, however, the county government took many steps to improve not only emergency communications with its municipalities and its citizens, but also its ability to control land uses and its preparedness.

Knowledge of What to Do

This refers to knowledge about emergency management in general, and about the specific hazard or disaster agent in particular. Emergency management encompasses planning, training, and coordination activities. Some hazard-specific knowledge and skills are hazard analysis, information gathering, and mitigation and preparedness. Such knowledge can be acquired by experience, from education or training, or by hiring a knowledgeable person.

Knowledge Proposition #1

Local officials in communities with known hazards, or ones at chronic risk, should determine before a disaster what procedures, requirements, and benefits are contained in the state and federal disaster assistance programs for response and recovery.

Predisaster information available about the Presidential Disaster Declaration process, what it entails and what it provides, leaves a great deal of room for improvement. Among the areas of greatest misunderstanding in localities that have been hit by major disasters are current and detailed knowledge of the Small Business Administration's

programs, and FEMA's assistance programs, particularly the Public Assistance Program which requires a 25% local match for the repair and restoration of public facilities.

Communities that were very well informed were Marin County, Estes Park, Phoenix, and Grundy. Two communities that seemed to have fared poorly in this regard were Cardington and Hull. Those communities where local officials commented "We'd never heard of FEMA before this disaster occurred" (Salt Lake City and Coalinga) had a slower rate of recovery. All other communities studied fell in the middle or average range.

Knowledge Proposition #2

In addition to identifying sources of assistance, it is essential to request assistance and resources with as much specificity as possible.

In the 20-county declaration of 1982 in California, Marin County requested and received help from the National Guard, but Santa Cruz County did not. After the snow melt in 1983 caused massive landslides along the Wasatch Front in Utah, the State Geologist's Office requested and received on-site assistance from the U.S. Geological Survey (USGS) with mapping and other activities. USGS provided several forms of assistance to the state for more than a year after the disaster.

You must know who to ask, what to ask for, and under what authorities the federal agencies may provide assistance, services, and personnel. Officials in the communities most skilled at this technique relied on professional networking and personal contacts at previous places of employment.

Knowledge Proposition #3

There is a need for realistic preparedness plans for all phases of a disaster. Such plans must be broad, flexible, and workable.

Many communities (Coalinga, Cardington) had a disaster that differed substantially from anything conceived of in their preparedness

plan, so they chose not to use the plan. Others had a completely unexpected disaster (Marin County expected seismic activity along the San Andreas Fault instead of floods and muslides), but they used their preparedness plan. In Paris, Texas, there was no plan about how to deal with federally supplied temporary housing (trailers), so there were protracted difficulties in establishing acceptable temporary housing, and this in turn led to added anxieties for displaced residents during the recovery from a tornado.

It is essential to get beyond a "paper plan" and to strengthen the community's preparedness. Informed, rehearsed officials and a useful set of guidance documents for use in an emergency are the goals, not a thick binder prepared mainly to fulfill a requirement but never before read by anyone.

General Observations

- **The local perspective** differs, often significantly, from that of county, state and federal officials. On occasion, there may even be wide variances in city and county perspectives; this was true in Coalinga due to the large geographic area involved, the city's relative isolation, and its economic base. It is important that researchers and persons providing assistance to disaster-stricken communities understand and respect local values, priorities, and preferences, even when monies are being provided by other levels of government.

- **That their community should and will recover** is almost always the opinion of local officials and residents. Officials at higher levels of government may question whether the community should rebuild as it was or where it was. There are at least two explanations for this divergence. One is that local pride, vested interests, and investment may lead to an unquestioning desire to rebuild. A second possibility

for the divergence of views is that local officials and leaders may lack the objectivity and disaster experience to ascertain correctly the wisdom and safety of rebuilding as is. Since state and federal officials usually have more disaster experience, their perspective on rebuilding may be more objective.

Coalinga provides an example of community in which the local people never seriously considered not rebuilding their city, but public officials at higher levels of government and some disaster researchers did. Experts agreed that if the city rebuilt according to seismic-resistant building code, the new structures could be expected to withstand future earthquakes.

While we did not observe a community in which a clear and imminent danger persisted, the city of Valdez, Alaska, is an example of local decision making having to be countermanded. After the Alaska earthquake of 1964, federal officials ascertained that the coastal city of Valdez would be at chronic risk from future tsunamis (seismic sea waves), as well as from earthquakes. The community was forced to relocate by federal disaster officials, because they refused to contribute any disaster assistance funds to rebuilding structures on land known to be at continuing high risk. The entire small town was relocated to a new site several miles away from the original one.

- **Small towns often are not understood** by researchers and public administrators who come from large, urban areas. These outsiders tend to underestimate the independence, tenacity, and ability of small town officials and citizens to cope. We observed more than once the unexpected capability and the resources of small towns.

- **Factual errors frequently appear** in postdisaster reports. Soon after a major disaster, teams of researchers and officials from various levels of government go on-site to ascertain needs and document

problems. Most of these groups prepare and circulate their reports. We noticed that many reports by state agencies, researchers, and others that were prepared within the first few weeks or months after a disaster often had errors that never got corrected in later reports. However, many times first impressions are wrong impressions. We learned this lesson after we visited Santa Cruz County for a second time; many mitigation and recovery decisions had taken a long time, but eventually ones were made.

We suspect that the erroneous information in the early status reports is less harmful to the municipality than it is to out-of-town researchers and public officials, who may rely on those secondary sources. Nevertheless, communities sometimes get "type cast" wrongly early in the recovery process, and then that image is perpetuated.

- **We think the earthquake recovery process** is slower than recovery from most other natural disasters. The reasons are that the relative infrequency causes lack of experience and knowledge about active seismic hazards, that less insurance coverage is likely to be in place for an earthquake than is true of a water-related disaster, and that there are added anxieties and delays in rebuilding because of aftershocks.

- **One of the difficulties of engaging in qualitative and behavioral analysis** is that it is subject to errors or variations. Some of these errors or variations are factual, while others are perceptual. With the passage of time, perceptions change, recollections may change, and first impressions may prove to be wrong impressions.

CHAPTER V

FUTURE RESEARCH

- **There is a need for greater understanding of how the dynamics of recovery differ in NFIP and non-NFIP communities.**

The recovery and postdisaster mitigation processes in flood-related disasters are different from those in other disasters because of the requirements of the National Flood Insurance Program (NFIP) on the community, the availability of flood insurnce, and the presence and influence of the federal Hazard Mitigation Team (HMT). While we observed positive results from the efforts of the Hazard Mitigation Team process, no systematic evaluation of the impcat of the HMTs has been completed to date. We have been told that the recovery process may be slower in communities that participate in the NFIP since program requirements tend to complicate and delay recovery decisions and federal/local payments. We were not in a position in our study to follow up on this issue. Of the 14 communities we selected to study, 11 had water-related disasters, but all 11 were NFIP participants so our sample of non-NFIP recoveries was too small to allow us to look for differences between the two groups.

- **More attention and more funds should be provided for recovery and less for response and immediate relief.**

In his study of family recovery after a disaster, Bolin (1982) stated:

> If reduced federal expenditures were a goal, our research suggests that emergency period services might be cut and an increasing emphasis placed on low interest loans, insurance and long-term support services. Given the atmosphere of the emergency period and that social support and altruism are prevalent values, cuts in federal aid might be less apparent than when the . . . recovery phases are underway. This is . . . based . . . on the value position that federal facilitation of long-term family recovery is desirable.

Bolin also recommended that "a strong federal role in post-disaster recovery should be maintained as the most effective way of maintaining reasonable levels of equity in victim access to recovery programs." Finally, he stated "There should be an increased emphasis on post-emergency and program information dissemination" (1982, p. 259).

Our own research suggests that far more attention should be paid to the recovery process, including the extent to which fundamental changes (such as in land use patterns or in building standards) are made and mitigation measures incorporated during that time period.

- **State and federal programs, regulations, and funding practices should be reviewed and improved to facilitate local recovery.**

Greater flexibility should be allowed by federal and state governments for local organizational arrangements. A more streamlined process for local officials to obtain economic and recovery planning assistance from other levels of government is needed.

All levels of government should work on helping local governments know more precisely what is involved **after** obtaining a Presidential Disaster Declaration. More information about the declaration process should be made available **before** a major disaster occurs. These should be efforts to reduce the aspects of intergovernmental relations that contribute to the adversarial aspects of that relationship in the postdisaster setting.

- **No noticeable pattern of progress is discernable with respect to the recovery process as it goes on in communities across the U.S.**

One might assume that with each successive disaster and subsequent recovery, the experience and insights gained by officials at all levels of government would contribute to more efficient recoveries in subsequent disasters. Unfortunately, there was little evidence to suggest that the lessons learned are being transferred from practitioner

to practitioner, or from researcher to practitioner. The exchange of information among the relatively few persons engaged in recovery research did appear to be coordinated.

As the lead federal agency, FEMA should review its experiences in disaster-stricken areas, and work toward providing education and training for FEMA staff and other public officials. The federal coordinating officers are a rich resource for such an evaluation process.

- **Greater attention needs to be paid to the interactions and tradeoffs that go on between expeditious recovery and mitigation.**

Rubin and Barbee (1984) opened the debate on this topic in a recent journal article, but it warrants further attention.

- **Some additional areas that deserve closer attention in future studies are:**

  1) city/county relationships (not only relationships among emergency management organizations, but general public management as well);

  2) the interaction of local public leaders and local business leaders, including the degree and timing of their coordination;

  3) variations in recovery rates in communities where damage is mainly to the public sector rather than to the private (residential and/or commercial) sectors; and

  4) the economic and development pressures exerted during the recovery period that militate against mitigation.

- **The actionable propositions set forth in Chapter IV, if restated, could become research hypotheses.**

The analytical framework of the recovery process was derived from United States experiences with natural disasters. It remains to be applied to recovery experiences in other countries, if appropriate. It also remains to be determined if this framework can be applied to recovery from human-caused disasters.

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PART TWO

CASE STUDIES

THE CASE STUDIES

In terms of the specific disaster agent represented, the 14 examples cover four riverine floods; three flood/mud slide events; two tornadoes; two winter coastal storms; one hurricane; one dam break/flood; and one earthquake.

Eleven of the 14 cases were water-borne disasters and the communities were in the National Flood Insurance Program. The Hazard Mitigation Team process was not in effect at the time we completed the first six case studies. The differences in the duration and quality of recovery owing (1) to the requirements of the NFIP, and (2) to the presence and effect of the Hazard Mitigation Team in those localities with a flood-related disaster remain to be explored in future studies.

Community	Nature of Disaster	Date of Field Study
Corpus Christi, TX	hurricane	1980
Scituate, MA	winter coastal storm/blizzard	1980
Hull, MA	winter coastal storm/blizzard	1980
Grundy, VA	riverine flood	1981
Pike County, KY	riverine flood	1981
Phoenix, AZ	riverine flood	1981
Marin County, CA	floods/mud slides	1982, 1984
Santa Cruz County, CA	floods/mud slides	1982, 1984
Fort Wayne, IN	riverine flood	1982, 1984
Cardington, OH	tornado	1982
Paris, TX	tornado	1982
Estes Park, CO	dam break/flood	1983
Salt Lake City, UT	snow melt/flood/landslides	1984
Coalinga, CA	earthquake	1984

CHAPTER VI

CORPUS CHRISTI, TEXAS

Background

Corpus Christi is an attractive, moderate-sized 217,000 population) community located in southeastern Texas on the Gulf of Mexico. The 62nd largest city in the United States, Corpus Christi is the county seat for Nueces County and covers an area of 176 square miles. Its economy is diversified, including major port facilities (for petrochemical and related products), several military bases, and tourist and recreational activities. Local officials do not consider the city a resort community.

Corpus Christi has a council-manager form of government, whose local appointed administrators are noted for longevity of service. At the time of the disaster, the city manager, city planner, city engineer, and assistant finance director had all held their respective positions for at least ten years, which means they were familiar with both Hurricane Celia (1970) and Hurricane Allen (1980).

Given its location on the Gulf of Mexico, Corpus Christi is no stranger to coastal storms and hurricanes. The city has suffered from at least one major hurricane in each of the past several decades.

Description of the Disaster

Hurricane Allen, which filled the Gulf of Mexico on the satellite weather maps, made landfall south of Corpus Christi on August 9 and 10, 1980. In addition to absorbing the impact of the hurricane, Corpus Christi and environs experienced flooding from rain run-off for several days after the hurricane struck. Also, several small tornados, which were spawned by the hurricane, struck nearby. The governor asked for

federal disaster assistance and received a Presidential Disaster Declaration for nine counties.

To understand the extent of the damage Hurricane Allen inflicted on Corpus Christi, consider the following:

- Between $8 and $10 million in overall damages were reported, with approximately $5 million to the bay front area (estimates cover munipal property only, not schools or homes).
- Thirty homes were destroyed and 2,078 damaged in Corpus Christi (in all of Nueces County, 347 homes were destroyed and 2,808 damaged).
- Three mobile homes destroyed and 51 damaged, with the average amount of damage estimated at $3,000.
- Forty-three businesses were destroyed and 118 damaged, with the average amount of damages estimated at $29,900.
- The estimated damage to public and private schools was $200,000.
- Unemployment reached 445 in Corpus Christi and 1,300 in Nueces County as a result of the hurricane.

Over the years, the city has acquired a great deal of waterfront property, much of which is currently used for green space or public beaches. The storm washed out or otherwise inflicted considerable damage to public parks and beachfront property, which was mainly undeveloped. Also, several municipally owned buildings located near the waterfront were damaged.

The city has a policy that persons in the low-lying, bay front areas should evacuate when a hurricane warning is issued. Nevertheless, neither city officials nor the Nueces County Civil Defense Office ever recommended that the entire community evacuate. City policy does require that key municipal employees remain in the city and be available for duty during or immediately after the storm.

Informal conversations with several persons who are not municipal employees revealed that most persons chose to leave the city voluntarily. The consensus was that those who were in Hurricane Celia

in 1970, which was a direct hit on the city, did not ever want another experience of that sort. (This substantial voluntary evacuation supports the findings of other researchers who maintain people tend to respond to a disaster warning based on their last major disaster experience.)

Since Hurricane Allen was weaker on landfall than the weather service had predicted, its impact was less severe than the city had feared. The residents and public officals in Corpus Christi experienced a relatively brief emergency response phase and, consequently, entered the recovery phase very quickly. The storm struck on Saturday and Sunday, yet most public officials were in their offices on Monday morning.

The characteristics of this hurricane were very different from those of Hurricane Celia (1970). Celia hit the city head-on, initially drew the water out of the bay (thus stranding boats), and caused less subsequent flooding from rainfall. Hurricane Allen differed in terms of intensity, warnings about its power, direction of approach, place of landfall, and attendant rains, winds, and tidal effects..

The city manager of Corpus Christi noted that the key variables determining the impact of a hurricane are the time of day; anticipated tides, wind, and rain; the rate of movement; and estimated landfall. A comparison of key data for Hurricanes Celia and Allen in Corpus Christi is shown in Table VI-1. Such differences highlight the difficulty of doing recovery planning for the aftermath of a hurricane, even when the community has previous experience.

TABLE VI-1
THE IMPACTS OF HURRICANES CELIA AND ALLEN

	Celia--1970	Allen--1980
Winds	Up to 180 miles per hour	Up to 92 miles per hour
Tide	Minus 4.5 feet	9 feet
Rain	7 inches	10.26 inches
Area deaths	5	2
Property damage	over $700,000,000	$10,000,000

Response Phase

The local citizens were well-prepared for Hurricane Allen not only because of the extensive weather service and media information and warnings, but also because of the frequent occurrence of hurricanes in the area. The city maintains an Emergency Operations Center (EOC) in the basement of police headquarters, and has a half-time civil defense coordinator. Three special characteristics contributed to the local preparedness capability: 1) the city has experienced frequent hurricanes (less than ten years apart), which means that citizens and officials were very familiar with that type of disaster; 2) several key apointed officials (e.g., the city manager, planning director, and city engineer) had been in office for ten or more years and had experiential knowledge of hurricane preparedness and recovery; and 3) the extreme destruction of Hurricane Celia (1970) has resulted in everyone who experienced it paying great heed to similar warnings.

Given the sizable population and amount of resources (personal and material) that were not affected adversely by the hurricane, the substantial preparednes measures taken based on past experience, and the

indirect, relatively light impact of Hurricane Allen on Corpus Christi--the locality weathered the storm and its aftermath quite well.

Recovery Activities

The local appointed officials commented that the recovery phase begins at different times for different disasters (even for two hurricanes), depending on the type and size of the event and on the intensity of and needs resulting from a specific incident. They pointed out that it is difficult to do recovery-oriented planning because it is not possible to know in advance which clintele groups, structures, or land areas will be the focus of concern during the recovery period.

While an observer might be tempted to state that a city that is chronically at risk from a single hazard--e.g., hurricane--would have an easier time performing emergency planning, the significant difference among hurricanes and their secondary effects (as shown in Table VI-1) underscore the difficulty of advance planning for long-term recovery.

After Hurricane Allen, the long-term recovery process in Corpus Christi was not centrally determined or orchestrated (i.e., by the city manager or mayor). Each sector (public and private) and even each city department (especially the public works and budget departments) made their own plans or took actions appropriate to that operating unit. In other words, the city did not have a specific recovery process, but rather an aggregation of recovery processes (formal or informal) used by sectors of public officials, local leaders, and other groups.

Staff Responsibilities

Nevertheless, the city does have some structure for dealing with the emergency phase, and departments and key individuals have prescribed responsibilities for emergency operations and short-term recovery issues. When Hurricane Allen struck the city, officials were ready to

move into the emergency response phase and assume their emergency-period responsibilities.

During the emergency response phase, three appointed officials have major responsibilities; namely, the city manager, planning director, and city engineer. For the recovery phase activities, these three officials, plus the buildings director, are primarily responsible for operations. While the city has a civil defense coordinator, who was on duty in the EOC during the emergency phase, that person's role in recovery was never mentioned by anyone interviewed.* At the time of the interviews--about seven months after the storm--the city engineer and buildings department director bore most of the responsibility for the remaining longer-term recovery operations.

Recovery Issue Identification

Among the major problems the city faced after the hurricane were:

1) The safety of the water supply. The drinking water supply was nearly contaminated by salt water driven up the river by the hurricane's winds.

2) The redevelopment of North Corpus Christi Beach. Hurricane Allen damaged numerous existing structures, which the city later removed. The net effect was that of a major clearance project, such as urban renewal.

3) The development of Padre Island. Residential development had been proceeding on this large barrier island before the hurricane. As would be expected, Padre Island was hit hard. A question that remains is whether the residents feel differently about living there after seeing the hurricane's effect.

The three main issues that Corpus Christi is working on in the aftermath of the disaster are described in greater detail below.

Water supply. Salt water, driven by the hurricane winds, went up the Nueces River and almost breached the relatively low walls of the city's water supply intake. Although the city had 35 million gallons in

*The coordinator was out of the city at the time of the site visit and therefore could not be interviewed.

storage, and would have had a short-term emergency supply for its residents, the problem could have been very severe. The city's water system supplies customers in a 7,000 square mile area with water derived from surface supplies (some persons in that area use well water). Consequently, the water service area that might have been deprived of supply is substantially larger than the city itself. The near-emergency water supply situation that occurred for the first time after Hurricane Allen is on the city's agenda for future attention, according to the city engineer, who said potential mitigation steps will have to be analyzed. At the time of the interviews, no action was either being taken or scheduled.

North Corpus Christi Beach. North Corpus Christi Beach is a low-lying peninsula of land that belongs to th city; in the past it has sustained severe damage from wind and water and no doubt will do so in the future. The beach area was semi-developed, with many run-down, undesirable properties. Much of the area,which is only a few fee above sea level, is unprotected on two sides. Before the hurricane hit, the city had invested as much as $40,000 per acre for beach restoration and water and sewer systems.

After the hurricane, the city took the lead in demolishing seriously damaged structures (offering free demolition to owners whose buildings were seriously damaged) and in removing debris to, literally, clear the way for private investment and development in that area. The demolition work was paid for with CDBG monies. Several city officials interviewed commented on the advantages of the clearance work and the current availability of large tracts for development. In short, they saw the positive results of an urban renewal project, which cleared out undesirable structures and made room for large-scale new development.

About one month after the hurricane, the local newspaper reported on a city council meeting during which the issue arose regarding the re-evaluation of the master plan for North Corpus Christi Beach, which was the work of the Department of Planning and the Planning and Zoning Commission. The city manager, according to the local newspaper, said that implementation recommendations would include a re-examination of the: 1) adequacy of zoning; 2) public acquisition of property; 3) extent of commercial development; and 4) requirements for a master plan for the beach. It should be noted, however, thta such comprehensive overview information did not come out during the interviews with the city manager, planning director, or other local officials.

Padre Island. Padre Island is a beautiful but vulnerable barrier island connected to Corpus Christi by a low-lying causeway. The Padre Island National Seashore occupies nearly 100 miles of the narrow barrier island that stretches along the Gulf Coast. Currently, the part of Padre Island that is not in the National Seashore is under the jurisdiction of Nueces County. The area is not well-developed, but many lots have been sold by a major developer who expects that a substantial amount of building will occur in the near future. The Padre Isles Development Corporation, a private company, owns 3,000 acres that have been divided into 7,000 lots for residential development. Currently 75% of the lots are sold, although half or less have been developed. Development has been carried out consistent with city building codes and standards (appropriate for participants in the NFIP) because the island is expected to be annexed by the city.

General recovery issues. Issues regarding the redevelopment of North Corpus Christi Beach and the development of Padre Island existed before the storm, but came to the forefront during the aftermath of the hurricane. Both places are very vulnerable in terms of their

geomorphology. In that connection, it should be noted that after the hurricane, the head of Insurance and Mitigation in the FEMA regional office wrote local officials that a recent study sponsored by the Federal Insurance Administration (FIA) indicated that some velocity zones appear to exist on North Corpus Christi Beach and on Padre Island and that such information should be taken into account in future development plans for those areas.

A velocity zone (V-Zone) is a coastal area in which waves have their greatest impact. While such zones cover a very limited geographic area, they represent an area of significant risk. Recently, the NFIP decided that to put the flood insurance program on a sound actuarial basis in V-Zones, it is imperative that wave height and stability of structure be taken into account. FEMA requires rating individual structures for purposes of setting insurance rates for construction or substantial improvements in a coastal high hazard area.

The recovery efforts to date have been city-directed for the most part. This is not surprising considering city land--mostly beach front and park land--and municipal buildings were most heavily impacted by the storm. The restoration of public lands is being accomplished with federal (75%) and local matching funds (25%).

No existing or ad hoc citizens groups arose during the initial recovery decision making period, probably because the damage to municipal propety was far greater, in dollar cost, than that to residential structures and other private property.

The business community will probably have a larger role in the redevelopment of North Corpus Christi Beach, for which the redevelopment process is just becoming active. A February, 1981, field visit revealed that the local Chamber of Commerce had appointed a task force to make recommendations to the city council regarding the development of North

Corpus Christi Beach. Another task force was also going to look into development questions on Padre Island.

In talking to the Corpus Christi Chamber of Commerce, it became obvious that the local business community is indeed interested in the future development prospects of both areas and has formed internal committees to study them. Of added interest was the fact that the city officials did not know (or so it appeared) about the two chamber committees. It appears that the local public and private sectorsare not (yet) coordinating their development planning regarding North Corpus Christi Beach and Padre Island.

City Relations with FEMA

In terms of intergovernmental relations in the early recovery period of Hurricane Allen, local officials stated that they found it more difficult to deal with FEMA regarding response and recovery than had been true for the last Presidential Disaster Declaration. Several people contrasted the vigorous, generous federal commitment to aiding the city after Hurricane Celia to the less than expedient experiences following Hurricane Allen. Two reasons for this were mentioned: 1) Hurricane Allen seriously affected nine large counties, only indirectly hitting Corpus Christi; and 2) the guidelines for federal assistance for public facilities have changed. Local displeasure with the perceived attitude of FEMA officials appeared to be separate from the recent match requirement for public assistance.

Needless to say, the local officials were unhappy about the required 25% local match toward the 75% federal contribution for public facilities restoration. Because of the difficulty in obtaining the local share, the city's efforts to repair or restore public facilities proceeded very slowly. (The city used funds that had been raised by a two year-old bond issue and CDBG monies.) Local officials were also

annoyed by the reporting and documentation requirements, which are required by recipients of public assistance.

Further, an exploitative attitude prevailed among some citizen groups in Corpus Christi and Nueces County, resulting in a sizeable number of fraudulent applications for assistance. This situation caused great problems and embarrassment for local and federal disaster officials.

The criticism was made of both state and federal officials that they did not know what the city needed, did not bother to ask, but proceeded as if they did. Further, top-level local officials complained about not knowing when federal officials had arrived and where they were going to open the FEMA one-stop centers. This raised questions about the applicant's briefing: if there was such a briefing, it was not well-attended or well-remembered.

The FEMA regional office had also planned to have an after-action meeting with officials of Corpus Christi and surrounding areas to discuss residual problems. That meeting was postponed and then cancelled, leaving unresolved the latent and residual misunderstandings and hostility.

Local/State Relations

The state was perceived as no help. When pressed, local officials conceded that the state had helped to assess the damage and had sent an auditor, but was no help in providing temporary housing. A city neighborhood improvement agency was asked to handle temporary housing not only for city residents, but also for displaced persons in a large radius around Corpus Christi. (It seems unusual to have a city agency handle temporary housing for a multijurisdictional area.)

Summing up the local perception of local/state and local/federal relationships in the aftermath of Hurricane Allen, the city manager said:

> The Federal Emergency Management Agency had the burden of coordinating the federal efforts through the state. Possibly the new system has some advantages, but they are not readily apparent. Unfortunately, all the state . . . provides is a pass through and, like most pass throughs, all that is really accomplished is red tape and delay.
>
> Hopefully, before the system gets changed again, it can be improved. All that most damaged communities want from the state and federal governments is a clear appraisal of what assistance is available so that the real task can be accomplished to the extent of available resources. The recovery process quickly points out the need to know all state, federal, and local agency officials who might be involved in disaster recovery before the disaster occurs, even to the point of calling them to renew acquaintances as the disaster develops.*

Public/Private Sector Relations

In the future, major development in the two identified recovery areas will be determined by the local private sector, for the most part, although any actions will have to be taken within the context of local building codes and standards imposed to be compliant with the NFIP. Given the presence of velocity zones in both development areas, as well as the known existence of the 100-year flood plain, the type of building will hvae to be carefully monitored and controlled by public officials.

Before the hurricane hit, the city had invested heavily in land preparation and infrastructure on North Corpus Christi Beach and, most recently, for the demolition of damaged structures. It has, in fact, done all that is legal in the state to encourage development. (State laws do not allow write downs or tax inducements.)

Likewise, the Padre Isles Development Corporation has completed subdivision preparation and other front-end community development work

*"Hurricane: Tracking Many but Knowing Few," Public Management, 63 (January/February 1981), p. 4.

appropriate to developing a sizeable new residential community. It, too, has done everything possible to attract buyers and home builders to develop the area.

As noted earlier, the local Chamber of Commerce has created two committees to address the issues and opportunities for development in the two areas identified. The results of their work were not completed at the time of the site visit.

Mitigation Measures

Since the late 1960s, the city has had building codes, zoning regulations, and other requirements that essentially were as stringent as those required by the NFIP. In other words, mitigation efforts were made for many years prior to the city's participation in the insurance program. Yet, there is constant tension (if not conflict) between the land use requirements and the building standards needed to conform to the NFIP and the political and economic pressures to build and redevelop. This conflict shows in both areas currently receiving primary attention--North Corpus Christi Beach and Padre Island.

Among the factors that counter the development/redevelopment in the two places are: 1) the low-lying land is patently vulnerable to wave and water damage; and 2) a letter from FEMA advising the city about the existence of velocity zones. The latter will mean higher flood insurance premiums and more stringent building requirements for future development. Nevertheless, the city has made a major investment in infrastructure and land preparation to make North Corpus Christi Beach attractive to commercial developers. Likewise, the Padre Isles Development Corporation has made the island attractive to residential developers. The desire to develop appears to be the stronger force.

Interviewers' Perceptions

One is struck by the city's continuous vulnerability to major damage from coastal storms and the accompanying water and winds. Given the frequency of serious coastal storm damage in Corpus Christi, if federal response recovery asssistance were not available the local tax rate would probably be so high that few people could afford to live there.

The emergency management capability of the city, especially for preparedness and response, is very good. The longevity of the staff, and their collective wisdom and experience, are unbeatable characteristics contributing to that capability.

The researchers are sensitive to the fact that the definitions and conceptual framework used in this study regarding the long-term recovery process are not necessarily those held by persons being interviewed. No one interviewed shared our perspective on the long-term recovery process and not all people understood it. In Corpus Christi, long-term recovery as a process is not centrally orchestrated (i.e., by city manager or mayor). As noted earlier, each sector and even each city department (espcially the public works and budget departments) made their own plans.

CHAPTER VII

SCITUATE, MASSACHUSETTS

Background

Scituate, Massachusetts is a small, quaint New England town bounded on the east and north by the Atlantic ocean, with a tidal shoreline of about 50 miles. Scituate has little commercial activity; tourism and fishing are the main industries. The population changes with the seasons--during the winter there are about 17,300 residents; the summer people double that number. In the past ten years, the number of year-round residents has been increasing at a rapid rate, yet little land use planning is accompanying this growth. The desirable exclusive shoreline has become crowded with new, expensive homes.

Scituate has a town meeting form of government, but has a full-time town manager. Although the town meeting form is the most democratic, it is also the most cumbersome. It does not lend itself to quick decisions and therefore does not fare well in negotiations with more centralized bodies. This was a frequent handicap to town officials during the recovery process.

The main actors in the disaster recovery effort were the town accountant, the public works director, and the chair of the Board of Selectmen. None of the others had administrative experience in coping with a natural disaster.

Description of Disaster

The blizzard of 1978 reached the coast of Massachusetts on February 6. Although storm warnings had been issued, the state was hit sooner and harder than the weather service had predicted. Snow began falling in the morning and by mid-afternoon the governor had declared a state of emergency and ordered workers to return home. The storm brought winds

of hurricane force, extremely high tides, and snow. The tides in Boston Harbor broke all existing records, and since the storm coincided with a perigee the tides were exceptionally brutal. More than 27 inches of snow fell in Boston before the storm headed out to sea on February 7. After the storm, temperatures remained below freezing for several days, which impeded rescue and relief operations.

Blizzards accompanied by high winds, strong tides, and severe damage are not rare events on the Massachusetts coast. The south shore has been hit by almost a dozen storms classified as "extreme" by the state climatologist, including the Great Colonial Hurricane of 1635. Scituate has a long history of sea storms and disasters, including shipwrecks off the town's coast. In 1972, a "nor'easter" destroyed 23 homes and damaged 360 structures causing $2.5 million in damage. During the 1920s and '30s, the town built sea walls and stone revetments to protect the shorefront. They have been repaired and extended, but not improved, after each storm.

The storm damage from the blizzard of 1978 was the most costly and extensive in the city's history. Scituate also sustained the most damage in the state. Destruction was everywhere. All beachfront sections were completely flooded. Areas behind the dunes that had been thought to be safe were flooded. The force of the ocean had tossed huge boulders into the streets and knocked houses off their foundations. Eighty-five houses were totally destroyed and 150 suffered structural damage of more than 50%. About 1,000 homes required some repair due to storm damage. A majority of the sea walls and riprap had to be repaired or replaced. Land forms also changed due to the wind and water action of the severe storm. The pilings in Scituate harbor suffered damage, and many fishing and pleasure boats crashed into the shoreline or were

thrown many feet inland. Commercial areas along the waterfront were flooded, but few were located where the majority of the damage occurred.

Response Phase

Rescue operations by the policy and fire departments began early in the afternoon as the town realized the severity of the storm. Employees of the Department of Public Works were sent out to keep sewer drains clear, shovel snow, plow roads, and provide services as necessary. One employee and the young girl he was trying to evacuate drowned. an ambulance, a fire truck, and many other town vehicles sustained severe damage due to salt water.

The coastal residents did not respond the way the town officials would have liked. Many stayed in their homes during the first high tide; when the storm did not affect them, the residents assumed they were safe. Unfortunately, the second high tide was more severe, which led pelple to try to evacuate at the height of the storm. Once the snow stopped, the National Guard was called in to remove debris, prevent looting, and ensure public safety.

On the evening the storm hit, the Board of Selectmen was in the process of firing the town manager, leaving the community without the services of a full-time official. In the absence of a town manager the selectmen created a response task force, headed by the town treasurer, to organize the town relief efforts. Although ad hoc, the group quickly developed an organizational structure, setting up emergency operations at the high school with the Federal Disaster Assistance Center.

The role of the business community in the long-term recovery process was very limited. Fishing people were interested in getting their boats back in the water and merchants wanted to get their stores repaired.

Although Scituate residents have seen at least two major storms batter and flood their community in the last ten years, the town has never budgeted any money for emergency preparedness or response. After the 1978 storm, the city finally enacted building codes that required measures to mitigate flood damage. The community's losses in the past illustrate the problems of living on the shore, but the short memory of federal assistance and devotion to the shorefront have reduced resident fears of severe coastal storms.

Recovery Activities

The main goal of the community was to restore the town to its prestorm condition, which meant replacing and repairing the sea walls and rebuilding the homes that had been destroyed or damaged. For the long-term recovery phase, a three-person committee consisting of the chair of the Board of Selectmen (who was also the designated federal local representative), the town accountant, and the public works director was formed.* This group met daily at first, later reduced meetings to once a week, and then met as needed. They have been responsible for applying for and monitoring all grants.

The public works director supervised the recovery of public facilities--a full-time effort that caused an 18-month delay in town improvement projects. The director was responsible for working with federal agencies, securing grants, hiring contractors, and overseeing all work. Using the Disaster Survey Reports (DSRs) prepared by the Corps of Engineers and the State Department of Environmental Quality Engineering, the town was able to secure a $7.5 million commitment from

*The current town manager has not been a member of this group because he arrived six months after the storm. His primary responsibility is to oversee the remaining recovery activities.

the FDAA to complete 248 individual projects. They applied for no other grants.

The primary project was to repair the damaged sea walls by either patching cracked areas or totally rebuilding the section. The second major project used $2 million to restore the bluffs and to rebuild a supporting wall that ran along the base of the bluffs. The third element was to construct a massive stone wall along the shoreline where sea walls had not been built.

All projects were designed to return the facilities to prestorm levels as allowed by federal regulation--a requirement that dismayed the publicworks director. As noted previously, the shore protection was built during the 1920s and '30s. Since then, stronger and more effective construction techniques have been developed. Nevertheless, few of these techniques--such as additional height, stronger footings, or reinforced concrete--could be used to their full potential because the town was unable to supply the additional funding to make major improvements.

It has taken three years to complete the sea wall construction, owing to the size of the project and the delays caused by administrative difficulties such as funding, budgeting, record keeping, and relations with the federal and state governments. For example, in the original DSRs there was no allocation for engineering costs. The Corps of Engineers had no authorization to help, and the state engineers had no funding. Although an engineer, the public works director had no expertise in sea wall construction. Instead, a friend who worked for the Corps of Engineers provided consultation services on the engineering aspects. That person was later fired because of generosity, according to one local official.

The second major concern of the town was the rebuilding of the 235 homes destroyed by the storm. The major issues were: 1) should individuals be allowed to rebuild their homes on the shorefront; 2) what stipulations, if any, were to be imposed on the design of new structures; and 3) what impact would other regulations regarding shoreline construction now in effect have on new construction.

The Conservation Commission

Most of the responsibility for overseeing the rebuilding of the residential structures fell to the Conservation Commission, which began its work immediately after the storm. The Commission is charged under state law with protecting the local wetlands and approving all structures that will be built in the flood plain. Because the majority of the houses damaged were in the flood plain, the Commission had to approve emergency building permitsthat are given to allow repairs to prevent further damage to the structure. After on-site inspections were made, 187 permits were issued.

The Commission is also responsible for approving the building plans for those structures that had suffered damage of more than 50%.* Commission members took their responsibility very seriously and tried to follow the Wetlands Protection Act to the letter. They felt it was their duty to evaluate each plan critically so that those who insisted on rebuilding along the shore would be protected. Each house plan had to be evaluated in light of recently approved state and local sanitation codes, floodplain requirements, and the state building code. The FIA required Scituate to include strict mitigation measures in the town building code or lose $2 million in individual aid. The Commission also

*The 50% rule caused some controversy. There was disagreement as to whether 50% damaged referred to structural damage or to the value of the house. The commission decided it meant structural damage.

implemented a comprehensive list of elevation, flotation, and other mitigation requirements.

The Commission was required to hold individual hearing to review the plans for each building permit. The townspeople began to resent this degree of individual scrutiny, which they perceived as excessive government. This animosity became so intense that legislation was introduced in the state legislature to ensure that homeowners would be allowed to rebuild without any interference from the town. The selectmen originally supported the Conservation Commission, but as the memory of the storm faded and citizen complaints became louder, the officials stopped endorsing the Commission publicly. Such actions gave the Commission even less credibility, even though their legislative authority continued.

Contractors

After the blizzard, every home along the water and a majority of the homes near the ocean needed some repair. Much of the work that was needed--such as electrical, plumbing, and carpentry--had to be completed quickly to allow families to return to their homes. Contractors from outside the community came to Scituate to find work. A number of them were from out of state and were not familiar with local building codes, procedures, or the effects of salt water on wiring and other materials; this caused problems regarding the appropriateness and quality of their work.

The town of Scituate employs only one building inspector, who is required to approve all building permits (about 800 of the 1,200 that were filed in 1978 were attributed to storm damage) and to help the Conservation Commission determine the 50% destruction requirement. During late 1980 and early 1981, there have been reports of shoddy work by contractors who arrived just after the storm. This has frustrated

the building inspector, who has neither enforcement power nor an adequate staff.

Federal-Local Relations

Some Scituate officials remember the recovery process after the storm of 1972. The Office of Emergency Preparedness, the federal disaster agency at the time, was responsible for repairing public facilities. It contracted with the Corps of Engineers to do all the construction; the community had only to approve the scope of the work. After the blizzard of 1978, the FDAA wanted to assume an advisory role with the state in the area of public facilities rather than maintain direct contact with the communities on a long-term basis. Federal teams came to Scituate to file DSRs for the town, but this was their only direct contact in coping with public facilities projects until the final audits.

Scituate officials would have preferred to deal with the federal government more often. Of major concern was the need to have regulations clarified, to demonstrate how inadequate regulations for rebuilding were in coastal communities, and to approve cost overruns as they accrued, rather than at the time of final audit.

The majority of the DSRs prepared during the response phase were surprisingly accurate, but they could not predict cost overruns due to necessary additional work, delays, or inflation. Scituate determined that a few projects would go above the anticipated cost, but the city did not want to spend additional dollars without receiving assurance that the federal government would reimburse the additional work. The response from the federal government was if the work was within the original scope, it would most likely be reimbursed, but the actual determination of eligibility would be made at the final audit. Scituate had no way of knowing if the overrun would be viewed aspart of the

original scope of the work because there were no regulations regarding record keeping.

City officials also resented the delays caused by FDAA. It was especially ironic that Scituate later had to petition the FDAA to extend the time frame on a project because of a delay the FDAA had caused.

State-Local Relations

Immediately after the storm, state officials established a Disaster Recovery Team (DRT) to help the towns affected by the storm cope with general long-term recovery issues. The team acted as the direct link to the federal government for the communities and helped to secure other state assistance. Scituate officials felt the DRT could not give them the two things they needed most: approval for cost overruns and technical engineering assistance. The state was viewed only as a pass-through function that hampered the city's ability to proceed with construction and general recovery.

The Conservation Commission felt that the state was more strict with Scituate than any other community. The commission maintained that other communities were not required to hold hearings or conduct on-site inspections for emergency permits. Scituate also held the unenviable position of a pacesetter--the state would not rule on the acceptability of another town's proposal until Scituate determined what it was going to do.

The DRT was not staffed by engineers or technicians. The team had no interagency agreements to allow them to tap the resources of other state agencies or financial resources to hire technical consultants. Although the head of the DRT changed three times during the first year, this did not hve a long-term impact on the team's effectiveness. With a change in governors, another new director took over, but the DRT has been all but ignored by the current administration. However, the DRT

staff believes this "benign neglect" has let them operate longer than would otherwise have been likely.

Each DRT staff member was given a case load of communities. Scituate officials felt the DRT was more effective in those communities whose leaders were not well organized when it came to state priorities, and less effective in those communities that had determined their goals, especially when answering substantive questions.

Mitigation Measures

Scituate instituted both structural and nonstructural mitigation measures in the course of recovering from the winter storm. The most extensive damage was caused by water breaching the sea walls. The rebuilding of the sea walls and stone revetments that run along the shoreline was a major structural effort due to their age and primitive engineering or construction. Despite the phenomenal cost, the sea walls protect the homes behind them only minimally. The federal government will reimburse local governments for repairing public facilities only to prestorm level. This limits towns from improving their facilities unless they will pay the difference. The sea walls that were totally rebuilt had the advantage of modern engineering in the footings and reinforced concrete; yet their height could not be raised to make them more effective because the town could not pay the additional cost.

The stone barriers are a work of art. Each side stone weighs a minimum of five tons and the top stones 15 tons. Yet their efficacy in taming a massive hurricane or flood is at best negligible.

Nonstructural measures included the addition of mitigation requirements to the building codes and the use of federal monies (under Section 1362 of the National Flood Insurance Act) to acquire beachfront property, remove structures, and maintain land as open space. Some

local officials wanted to restrict reconstruction on the oceanfront. They realized that any structure that was built would not be able to survive a major storm and that homeowners needed a monetary incentive to keep them from rebuilding. A bill was introduced in the state legislature to appropriate money to purchase waterfront land from willing sellers, but did not pass. The town then approached FEMA to determine its eligibility for the Section 1362 acquisition program. At that time, however, Congress had not appropriated any funds, and it was not until 1980 that Scituate began the Section 1362 acquisition process. Town officials contacted owners of eligible properties to determine if they were willing to sell, turned the names over to FEMA, and the formal processing began. The agreement between FEMA and Scituate was that the town would acquire the land as a gift and would be required to keep it as open space.

Before any acquisition could take place, a town meeting had to agree to accept the land that would be acquired. The measure was soundly defeated at a special meeting in June 1980 for a number of reasons. Many residents distrusted the federal government, fearing that it was not being candid about the actual costs and benefits to Scituate in accepting the parcels as gifts. Others believed that if the land were turned into open space, undesirables would take over the Scituate beaches. There also was concern over the loss of taxable property. The major reason for defeat, however, was that a number of people from the Humarock section of town, who would not have been directly affected by this action, overwhelmingly opposed it because FEMA had refused to fund a project for additional shore protection for their area.

Despite the local vote, some homeowners were still willing to sell their property. Subsequently, the federal government bought a few parcels and turned them over to the state's Coastal Zone management

Office instead of to the town. The state currently is negotiating with the town to give them the parcels as a gift on permanent lease.

Housing

Scituate's main concern during the recovery process was to get everything back to normal. The only major mitigation effort the town undertook was the creation of new building codes, which were required by the NFIP. As the memory of the storm faded, town officials and many residents forgot about the severity of the damage and lost interest in supporting the Conservation Commission and issues of mitigation and relocation. there was no commitment to long-term mitigation measures, particularly to those that would require substantial changes in residential construction. Town officials believed mitigation requirements were meaningless because they only had the promise of future federal aid, which was thought to be essential for implementing mitigation measures. Town selectmen felt a firmer stand should have been taken by the federal government.

The FIA and the Small Business Administration (SBA) spent millions of dollars in Scituate to repair and replace houses. In 1978 federal dollars were used to repair many of the same houses repaired in 1972. this time the owners rebuilt in compliance with the elevation and building standards required by the NFIP.

Many of the homes that were rebuilt are larger and have a higher assessed value than the previous structures. According to the town assessor, this is because the owners were able to get low interest loans that allowed them to build previously unaffordable luxury features. (Unfortunately, many homeowners have been shocked and in some cases almost unable to pay their increased tax bills). The worst part, according to the town engineer, is that these dream homes, despite being

built to the existing town requirements, still will not be able to withstand the force of a storm similar to the blizzard of 1978.

Interviewers' Perceptions

Small towns with few financial resources and limited staffs are likely to have more difficulty recovering from a massive disaster than larger, more sophisticated communities. Coping with a multimillion dollar project is a difficult job in its own right, but Scituate's three-person team also was faced with balancing citizen views with federal and state requirements.

Town officials noted three major impediments to full recovery:

1) Federal money can be used to restore public facilities only to their prestorm level. Scituate rebuilt sea walls that are inadequate for the needs of the town because it did not have the additional funds to upgrade the improvements. Consequently, the federal government, the town, and the homeowners will continue to make repairs to the same structures at an ever increasing cost.

2) Cost overruns cannot be approved until the final audit. Scituate has been unable to learn from FEMA whether it will be reimbursed for cost overruns incurred years before. As projects are being completed, town officials would like an intermediate inspection program to re-evaluate DSR estimates.

3) Engineering and overhead costs are not included in the DSR. A major project, such as sea wall construction, requires a significant amount of time from engineers and other specialists, as well as the attention of local staff. Not to include these costs in the DSR is not cost effective in the long run.

Although Scituate's complaints about its current recovery process seem valid, the town has done little to prepare itself for the next major coastal storm. Since the blizzard of 1978, the city has not engaged in any emergency preparedness or response planning or training. According to the former treasurer, there has never been a budget for civil defense. Some officials expressed a desire to have a plan, whereas others were complacent, saying that when a storm strikes, the town will cope. One official remarked that the state should help

them write a plan. Another said that since the state and federal officials arrive and begin to work immediately after the disaster strikes, the community does not need a plan.

This reluctance to put the town's experience into a plan is workable as long as the officials who handled the 1978 blizzard are still in office. However, the city manager--who is also the civil defense director (in title only)--has no experience with emergency management. This lack of concern over how to cope with the next event will only make it more difficult to respond and recover efficiently.

CHAPTER VIII

HULL, MASSACHUSETTS

Backkground

Hull, Massachusetts is a small town (11,000 population) located 12 miles south of Boston, that lies on a narow peninsula separating Hingham Bay from the Atlantic Ocean. At its narrowest point, there are 600 feet between shores; at the widest, 2,500 feet.

Hull was once a summer resort for the wealthy, and large picturesque homes still line the rocky coast that faces Boston. Today, Hull entertains working-class families. Its major attractions are a run-down amusement park and a narrow strip of beach, which in the summer swell the daytime population substantially. Hull is currently being eyed by developers as a potential New England-style Atlantic City, as plans are being considered to turn a once-grand mansion into a first-class gambling casino. This development would increase the population year-round and give the town additional revenues as well as additional burdens.

Hull has the town meeting form of government, which has been a source of aggravation to many local leaders. A common complaint is that it is difficult to get action under this form of government, which resulted in delays in the recovery process. Further, government inaction resulted from the inability of a majority of the town's officials to cope with the complexities of the federal government relief programs or the state grant process.

Description of Disaster

On February 6, 1978, Hull and other cities along the Massachusetts coast were hit by a fierce blizzard that caused two record high tides. Snow accumulations reached 27 inches in one day. Hurricane-force winds

caused water to breach the sea walls, and, at some points, for the bay and the ocean to meet on land. Although the state is accustomed to winter "nor'easters," this storm was particularly devastating because of its ferocity. A state of emergency was declared by the governor early in the afternoon on February 6 to keep people off the roads.

All parts of Hull were affected by the storm. Not only did the town suffer from flooding, but also from drifting snow. The southwest end, which is at a higher elevation, was battered by high winds and snow, with only occasional flooding. The major damage to residential and public property was caused by flood waters that did not recede. The town's elevation is slightly lower behind the sea walls, thus all of the water that came over the walls remained for three or more days, turning the residential areas into a huge catch basin. It was this extended contact with water that did the most damage to property. Water and wind destroyed 14 structures, with 75% of all structures needing some repair after the storm.

The storm severely damaged public facilities such as storm sewers, streets, and sea walls. Most of the town's street lighting system was downed by ice on the electrical lines. Flooding also caused severe damage to the sewage treatment plant that was under construction.

Response Phase

The immediate response phase was uncoordinated and chaotic primarily because town officials were not organized to respond to the diaster. The town emergency plan was ignored since it did not adquately address the problem of flooding. The Board of Selectmen were notorious for being unable to reach consensus on any issue, and the disaster only made the relations worse. The town's executive secretary had been fired shortly before the storm, and the public works director was pressured to

resign, thus leaving the town with a reduced capacity during a very difficult period.

The storm cut the town into islands. Water completely covered the land from shore to shore in at least two places. Rather than unite to make decisions for the benefit of the entire town or plan for the days ahead, each selectman went to the shelter closest to home and began making promises and decisions without the approval of the board. It was not until three days after the storm that the selectmen met as a unit.

An emergency operations center was established in the municipal building and used for six days. Victims of the flooding were moved to large shelters operated by the Red Cross. Many did not follow instructions to bring blankets, nonperishable food, and other necesities, but **not** pets, to the shelters. These nonconforming actions caused confusion, havoc, and in some cases violence. The governor had to step in and order additional shelters and other measures, including busing families 30 miles inland, in order to provide safe and adequate temporary housing. The town made a diligent effort to get people back to their homes as soon as possible, but disagreements between the building inspector and the public health director over the safety of the homes delayed the process.

The first week after the disaster, the selectmen made a persistent effort to organize themselves and to agree on a course of action. This included relying totally on outside resources for the town's initial response and recovery, primarily the state Civil Defense Office, National Guard, state DRT, and federal government. There were no officials in Hull with any disaster response or recovery experience.

Recovery Activities

As the recovery began, the majority of the town officials realized that the following problems needed to be rectified: insufficient shore

protection, inadequate storm drainage, and lack of floodproofing at the sewer treatment plant. Many individuals interviewed had personal agendas they felt were important and on which they had tried to act. For example, the then-current chair of the Board of Selectmen felt that the storm provided a perfect opportunity for the town to thin out, to discourage and legislate against development along the shoreline, and to construct increased protection for shorefront housing. The civil defense director wanted to get more radio equipment and supplies and to use the disaster as a way to remind local busineses to complete their disaster equipment inventories. The community development director was hopeing for increased mitigation measures for residential construction. With the exception of increased radio equipment, these aims were only moderatey supported by the community.

Before the disaster, the majority of town officials and residents took a reactive position regarding emergency management (and no doubt other areas as well). The local decision makers, given this reactive posture, exhibited little foresight. After the blizzard of 1978, it was not long before the state DRT realized the town did not have the capacity to cope with repairing millions of dollars in damages to public facilities or to help residents recover from their losses. Hull could not take the lead on recovery activities because there was no town manager or public works director and because the selectmen were divided over how to coordinate recovery activities. This lack of central coordination was reflected in the fact that each time the city received a major grant, a consultant was hired to take charge of it.

In the first month after the disaster, recovery efforts went relatively smoothly because the town's designated representative, a selectman, had been given leave from his job to take care of Hull's immediate needs and coordinate the city's long-range recovery process.

The DRT, realizing that this type of professional management and coordination needed to continue, funded a full-time disaster coordinator with a grant from the EDA. Originally, the coordinator was to consult with Hull and the neighboring towns of Cohasset and Scituate. As it turned out, Hull's problems were so severe that the coordinator devoted all efforts to the city. The first person to hold this job remained for about a year and was then replaced by a certified public accountant who is involved primarily with record keeping and accounting, but oversees the remaining disaster recovery work.

Public Projects

The DSRs estimated that it would cost $6 million to complete 84 public projects.* The two most costly projects funded by the FDAA (predecessor of FEMA) were the rebuilding of shorefront protection and the repairing of the wastewater treatment plant. Each project cost $2 million. An additional $700,000 was used to restore the municipally owned street lighting system, and $1.3 million was used for clearance, demolition, and road repair.

Shore protection. The storm damaged or destroyed most of the sea wall on the ocean side of Hull. When the repair work was about to begin, the town discovered that although it had maintained the sea wall, it did not own all parts. The town negotiated easements for property it did not own in order to avoid further delays in construction. The Board of Selectmen and the disaster coordinator hired an engineering firm to rebuild the sea walls, which were being completed at the time of the interviews (March of 1981). The public works department had little involvement because the position of director was vacant during most of the reconstruction, as it is now. The town officials are convinced the

*More federal money was spent in Hull under a number of different grants, as will be described in the following pages.

rebuilding that was done was not the best possible because of the legal requirement that specifies a community can be reimbursed only for the expenses necessary to bring the facility back to prestorm condition. The chair of the Board of Selectmen believes this hurt the town because many of the sea walls were inadequate when the storm hit. The time wa perfect to replace the sea walls with ones that met current standards, but the city was unable and the federal government unwilling to pay the additional cost.

Nantasket Beach dune stabilization. Nantasket Beach runs along the oceanside of Hull. Half of the beach is operated by the Metropolitan District Commission (a regional water, sewer, and parklands agency) as public beach; the other half is owned by the town. Sizeable dunes run along the shore road. The residents in the Hull incorporated area rely on the Nantasket dunes for storm protection. The blizzard caused significant damage to the dunes, and the town applied to FDAA for aid to rebuild them. The FDAA disallowed the expenditures because in order for the project to be funded the dunes must be human-made. The town claimed they were, but the FDAA felt there was insufficient evidence to prove it.

City officials then applied for CDBG funds from the state, which agreed to fund the project and commissioned a major engineering study. Town and state officials tried to "sell" the recommended improvements to the residents, but the project was never approved. The homeowners believed the dunes would be 16 feet high, which would make it impossible to see the water from their homes, watch their children on the beach, or monitor those who were on the beach, and they would prevent handicapped persons from gaining access to the beach because of the prohibitive height. The confusion arose over the difference between height above sea level and height from beach level. Actually, the dune level would

have been only four to five feet high. The town could neither prove to many beachfront homeowners that it owned the beach nor guarantee the added height would increase protection. In addition, the cost of maintaining the dunes was estimated to be very high. Unfortunately, this was the only structural mitigation measure that could be taken to protectthe homes alongthe beach. Consequently, no structural measures were taken in the aftermath of the disaster, but damaged and destroyed homes were restored or rebuilt.

Bluff restoration. Over the years, the houses built on the Hull bluffs had increased the amount of runoff the soil had to absorb. The soil was weakened because the runoff created a looser base,making the lower portion of the bluff more susceptible to scouring and erosion during storms. The February blizzard demonstrated the weakening as the bottom of thebluff did suffer significant damage. The DRT provided funding to study and do major restoration on the bluffs. After completing the project, the DRT admitted if they had the choice again, they would not fund the bluffs because the cost was too high for the minimal number of homes helped by the restoration.

Sewage treatment plant. In February of 1978, the town's sewage treatment plant, which was being built in compliance with federal wastewater treatment standards, was 98% complete. The plant is located at the edge of Hull; from its doorstep both the ocean and the bay are visible. The winter storm completely flooded the plant, damaging or destroying $2 million in equipment. It was evident that the floodproofing measures were not adequate. Many residents were not upset by the damage because the treatment plant had been a source of controversy for many years.

Before beginning the repairs, the decision had to be made as to who was responsible. The plant had not been turned over to the town (which

did not want the financial burden). The FDAA had no precedent to fund the repairs, and the EPA declined responsibility because the plant was theoretically town property. The Corps of Engineers and the State Department of Environmental Quality Engineering were considered possible funding agencies, but both were reluctant to get involved. Eventually, all these federal agencies shared in the costs of repairs. The current chair of the Board of Selectmen maintains that if the town had owned the plant, considerable time and effort would have been saved and the repairs would have been allowed under the public assistance program.

Municipal lighting systems. Heavy snow and sleet from the blizzard pulled down large portions of the town's lighting system. Using the funds provided by a FDAA grant-in-lieu, the municipally-owned electric company replaced the lighting system and improved it by using copper rather than aluminum wiring. The switching system was also changed from manual to automatic.

Storm drainage. Prolonged flood conditions did most of the damage to the residential and public property. The floodwaters remained in Hull for two or three days because of an inadequate storm drainage system. The state could not make pumps available to get the water out of the streets. While the town waited for the water to recede, public works employees dug channels through existing sea walls to let the water out.

This prolonged flooding will not happen again because the town is rebuilding its entire storm sewer system with funding from a Comprehensive Small Cities (HUD) grant. Sewer lines are being enlarged and a pumping station installed, which can pump water into Hingham Bay.

Town Involvement with Residential Repair

Hull had a CDBG-funded residential rehabilitation program under way at the time of the storm. The program, aimed at low- and moderate-

income families, provided grants between $5,000 and $8,500. After the storm, these monies were used to help families rebuild their storm-damaged homes. CDBG dolars, SBA funds,and emergency CDBG money from the state were used to fund the rehabilitation work. The CDBG program provided an additional code inspector to check for damage, to estimate repairs, to determine funding availability and applicability, and to provide other financial or technical assistance as needed.

The state provided money, from a state CDBG grant, to elevate utilities and other essential structures. The floodproofing program was under-used for the most part because elevating homes was incredibly expensive and there was no interest in elevating utilities.

Hull continues to offer the utility raising program, but the demand has not been heavy. The community development director indicated that although many residences needed repair, when those repairs were made little was done to mitigate against flooding in the future.

There was little controversy over the rebuilding of damaged homes. The local Conservation Commission was charged by state statute to protect the wetlands. To do so, the commission must review, hold a hearing, and approve any rebuilding plan for a structure built on the wetlands that was damaged 50% or more. But, the commission had relatively little restrictive effect on such rebuilding because of the wide interpretation of the damages standard.

Finances

Hull was plagued with organizational problems before the diaster; when the blizzard struck, it exacerbated them. The state DRT and the town's designated representative worked to get the DSRs completed and to secure as much federal financial assistance as was possible. As the work began and federal spending requirements mounted, the state realized that the town accountant was unable to cope with the additional work.

This led to the decision to hire a disaster coordinator, who unfortunately--along with most of the town officials--was lax about record keeping. The lack of adequate records has become a serious problem because the federal audits are beginning.

The second financial problem for Hull is the federal process for getting money. Since FDAA operated on a reimbursement basis, Hull had to raise the money to complete the projects. Cities and towns cannot deficit spend without the approval of the State Emergency Finance Board and the governing body, a restriction that delayed the completion of many projects.

Hull also received a disaster loan from a HUD discretionary fund, which was used to defray administrative costs. The disaster coordinator is hoping to obtain a waiver of the loan requirements and receive the money as a grant.

Mitigation Measures

Hull's short-term mitigation measures included the replacement of the sea walls and other shore protection, which were undertaken as part of the rebuilding process. Their effectiveness as mitigation measures may be negligible if Hull receives a similar storm in the near future. The remainder of the town's mitigation projects were planned as long-term measures.

Acquisition

Hull was approached by FEMA to consider using Section 1362 monies to acquire beachfront land. The town refused. Local residents were not interested in selling their property as long as it was unclear who was going to manage it. During initial discussions, it was suggested that the Metropolitan District Commission take the land since it controlled the major beach in the town. Residents refused because a significant

rift exists between the town and the commission. The town felt that if either it or the federal government had guaranteed control, the acquisition would work. The current chair of the Board of Selectmen thinks the Section 1362 program would be a great land use tool for "pruning" the coast of the little houses that cover the waterfront.

Civil Defense

The Civil Defense Director, a volunteer part-time employee, explained that once the severity of the situation was realized, the emergency operations plan was discarded and the players began to act on instinct. Since the 1978 blizzard, Hull has reassessed its civil defense needs. There is now an emergency oeprations center in the municipal building and two back-up radio rooms in other parts of town; an increase is also in the town budget for supplies. The director realizes civil defense functions do not have top priority and concedes the town does not have a formal emergency plan. The director does believe, however, that there is enough support and necessary means to cope with emergency management.

Emergency Management Capability

Hull's emergency management capability rests solely with the more sophisticated selectmen and, temporarily, with the Disaster Coordinator. Little effort has been made to institutionalize the recovery capability. The town is fortunate, however, to have a more capable Executive Secretary (manager) than it had in 1978. The current manager shows a capacity to understand the federal and state grants system, but has not had first-hand disaster experience.

Ordinances

Two ordinances were passed at a town meeting as a result of the storm. One ordinance now requires utilities to be raised out of the basement to avoid the dangers encountered previously. The second

increased the minimum lot size to help control the amount of construction on the remaining beachfront property.

Interviewers' Perceptions

Hull is a poor town; 50% of the residents are on some form of assistance. The town is unable to undertake substantial projects or initiate major land use or property ownership changes on its own. All major repair projects take place because the federal government imposes or pays for them. The local leaders do not have the stamina to create changes from within.

For example, a lot at the narrowest part ofthe town has long remained vacant due to local public indecision. Twelve years ago, a developer purchased the land to build a high-rise for the elderly. Because of zoning fights, funding difficulties, and legal battles, it has not been built. The selectmen realize that if the proposed building had been occupied during the blizzard, it would have been flooded and severely damaged. Nevertheless, they are unwilling to prohibit its construction. The town manager is discouraged by barrier beach conservation requirements because they have stymied development in the town.

The Nantasket Beach project is an example of residents being unwilling to agree to make minor changes to improve their safety. Because they will not try to understand the proposed project, they are willing to suffer more damage.

It appears that Hull will continue to muddle through recovery activities. People will remain in their unprotected homes and suffer the consequences. The next storm will test the town's new emergency response systems. Because there is no plan and no local public officials who are familiar with emergency management, the leadership will have its ingenuity tested as well.

CHAPTER IX

GRUNDY, VIRGINIA

Background

Grundy, Virginia, a tiny town of approximately 2,000 residents, is located 93 miles west of Blacksburg on a narrow flood plain along the Levisa River. The town covers slightly more than five square miles and is bordered by steep mountain slopes.

Grundy is the seat of Buchanan County. It has a mayor-council form of government, part-time town officials, and a local economy that is heavily dependent on the mining of metallurgical coal. In 1980, unemployment in Grundy was lower than in most areas of the country, but staggering inflation, soaring rates of interest, and "coal's poor market conditions" left the economy "somewhat listless," according to the area newspaper. Economic conditions had not improved during the first several months of 1981.

Description of the Disaster

On the morning of July 15, 1979, severe thunderstorms dropped 4.2 inches of ran within a two-hour period on Buchanan and adjacent counties. More rain fell on the following day. These storms caused serious flash flooding in the Hurley and Knox Creek areas of Buchanan County and some minor flooding in Grundy.

According to official reports, the torrential rains and rising waters in the county were responsible for the deaths of two persons and for injuries to 50 others. Additionally, 54 homes, 12 trailers, 15 businesses, and 108 vehicles were either severely damaged or destroyed. The flood also damaged or destroyed 257 bridges (251 private, 6 public), 76 miles of road (26 miles private, 50 miles public), and Grundy's water and sewer systems. Finally, the rising

waters forced the evacuation of approximately 200 families and caused damage estimated at $8.7 million ($3.7 million public, $5 million private), a figure that indicates the flood was much less serious than several others that have occurred recently.

Response Phase

Soon after the rains began, the Emergency Services Coordinator for both Grundy and Buchanan County contacted each member of the County Board of Supervisors. The board was requested to convene to determine if an emergency was imminent. The board, which met during the afternoon of July 15, quickly decided that there was reason to begin emergency operations. On July 17, an executive order proclaimed that a "state of emergency" existed in Grand County. The following day, President Carter was asked for a Presidential Disaster Declaration. The declaration, which was issued two days later on July 20, authorized the FDAA to cover the **full cost** of repairing storm-damaged structures.

The board had accepted the Coordinator's recommendation to close the major road into Grundy, and ordered the evacuation of persons whose houses had been severely damaged or destroyed or who could not reach their houses because their private roads and bridges had been washed away. The board also instructed the coordinator to establish a first-aid station and a public shelter with food, bedding, baby formula, and medical supplies. A private helicopter owned by a board member was made available for emergency use. Because most of the flooding and serious damage occurred in Buchanan County, rather than in Grundy, the county officials organized the immediate response. Nevertheless, the county officials did consult with the mayor throughout the emergency period.

During that period, the mayor and the council also met. They instructed the town's water department to begin repairing the damaged water and sewer systems, and called on several local mining companies to

assist in removing debris from blocked and damaged roads. The mayor and council also decided which town employees would work overtime during the crisis and how traffic was to be routed through the town.

The residents of Grundy pride themselves on their independence and pioneer spirit--on their willingness to "pitch in" and help their neighbors in times of crisis and on their reluctance to ask for help unless it is absolutely essential. One official illustrated this point by noting that more than half of the people whose homes had been seriously damaged found shelter with friends and family. Relatively few, in other words, found it necessary to wait for federal or state assistance. Another official recalled how willing and ready the mining companies were to respond to the council's request for heavy equipment.

Despite the reluctance to accept assistance, Grundy did receive help from a variety of sources. The state National Guard, for example, provided personnel and equipment to assist the locals in rescue and evacuation efforts. The guard also established 20 water supply points throughout the county. Moreover, the state highways and transportation department helped to remove debris, the Red Cross contributed first-aid supplies, the FDAA sent mobile homes to be used for temporary housing, and Mennonites from several neighboring states assisted homeowners in cleaning the mud and debris from their yards and houses.

Within seven days of the initial storm, virtually all of the immediate human needs had been satisfied. The water and sewer mains had been repaired, all of the homeless had found temporary housing, and clean-up activities were well under way.

Historical Context

Eleven floods have ravaged Buchanan County since 1929. Prior to the flood of 1979, the most recent was in April, 1977. That flood swept through downtown Grundy and caused more than $99 million in damage

throughout the county. Many residents consider the April (1977) flood to be the worst in the county's history. Other floods occurred in 1957, 1963, and 1967.

Despite these experiences, few of the locals have moved away. Some claim that their pioneer spirit enables them to view a disaster as a challenge to be met and overcome. Others assert that there is little they can do to avoid the floods because most of the county's inhabitable land lies within the flood plain. For many of these people, moving out of the county and away from their jobs and families are unacceptable alternatives.

It would seem, then, that most of the residents of Buchanan County sould be acutely aware of the need for mitigation measures--and, in fact, many are. That awareness, however, has not been converted into a persistent demand on public officials for mitigative actions. Though difficult to explain, one reason might be that many of the residents have been preoccupied with more immediate and presssing economic problems. Consider, for example, the period following the flood of April, 1977--a time when a concern with mitigation should have been high, but was not. During that period, construction on a mid-town road project had begun, which resulted in a traffic slowdown, a loss of parking, and lower wages for coal haulers. This, in turn, had an adverse effect on retail sales. In September, the United Mine Workers went out on strike; and in November, there was a second flood warranting a federal disaster declaration. Many of the temporary repairs to the water and sewer lines damaged the previous April had to be redone. Then, between January and March of 1978, snow and ice covered many of Grundy's roads, bringing shopping in the downtown area almost to a halt. By the middle of 1978, the snow and ice had melted, but a railroad strike virtually paralyzed the economy of the town and

county. Finally, in January, 1978, the coal industry encountered a "soft" market, and production was severely curtailed. The point here is that poor economic conditions may be responsible for the fact that mitigation has not been a high priority for many of Granville's residents.

It should be noted, however, that between April, 1977, and June, 1979, approximately 10% of the households in Buchanan County purchased flood insurance while the community was in the emergency phase of the NFIP. (Recently, more residents have been purchasing flood insurance; the community now is in the regular phase of the NFIP.) This suggests that many of the area's residents did consider flooding to be a serious problem prior to the storm of July, 1979.

Recovery Activities

As noted earlier, most of the damage caused by the flood occurred in the county, rather than in the town of Grundy. Consequently, the County Board of Supervisors organized most of the recovery activities. According to several sources, those activities focused almost exclusively on the restoration of damaged roads and bridges because those structures bore the brunt of the rising waters.

The County Board of Supervisors is composed of seven elected officials, each of whom represents a district within the county. Soon after the emergency had ended, these officials toured their districts to estimate the damage with representatives from FEMA and the highways and transportation department.

Though each of the seven supervisors was well aware that federal funds would pay for most of the restorations, there is little evidence that any of these officials viewed the disaster as an opportunity to implement capital improvement projects that had been planned prior to

July. In other words, the board appears to have been quite content to restore the roads and bridges to predisaster conditions.

When estimates of the damage had been completed, the board organized efforts to build temporary bridges where they were needed most. In many cases, these were private "access" bridges that crossed the streams and creeks that ran between homes and roads. The building of temporary bridges was deemed essential because many of the families whose houses had not been seriously damaged were living in temporary shelters because they had no way to reach their homes. According to one official, the cost of these temporary bridges was included in the DSRs.

During the third week following the flood, the board accepted bids for rebuilding the damaged county bridges. An engineering firm from nearby Marion was hired to develop specifications and to review the technical merits of each bid. Ultimately, the board chose from among the bids and signed contrats with the winning firms, most of whom were based in the state and county.

The rebuilding of the private bridges was handled somewhat differently. In many cases, the board used hourly labor to complete repairs. In other cases, they simply selected a reputable contractor, without inviting bids. And, in still other cases, residents were told how much money they could spend on repairs and were then allowed to decide for themselves who would do the work. In several of these cases, the cost of repairs exceeded the allocation, and the residents were required to pay the difference. A bidding process was not used for the private bridges because the FDAA had assured the board that bids were not required for projects of such limited scope.

It should be noted that these projects were paid for with federal funds. Though somewhat unusual (typically, federal funds would not be used for repairing such privately owned structures), it is likely that

federal officials believed that the cost of repairing the access bridges would be less than the cost of relocating those families who could not reach their relatively undamaged houses.

Although federal funds eventually paid for the rebuilding of virtually all damaged roads and bridges, the county was required to finance a large portion of each contract. For some, the county "fronted" 25%; for others that figure exceeded 90%. According to two officials, this was a problem because the county was forced to borrow money at high rates of interest--and interest is not a recoverable expense. The officials also complained that all of the federal funds still have not reached the county, a delay that is draining thousands of dollars from already-depleted county coffers.

By the middle of October--roughly three months after the flood--nearly all of the private bridges had been repaired. Within six months, most of the county bridges (and roads) also had been repaired. The Board of Supervisors is proud of the fact that they were able to complete the recovery so quickly. Local opinions of the state's response to the disaster were quite favorable. The only negative comments focused on the length of time (14 days) the state took to process the Public Assistance checks and pass the money on to the town.

Mitigation Measures

For public officials of both the city of Grundy and Buchanan County, mitigation is a household word. Indeed, the officials recognize the need for flood prevention measures and have devoted considerable time to developing a mitigation strategy. This concern with mitigation, however, did not emerge in the wake of a single disaster; instead, it slowly evolved as a natural response to a frequently occurring problem.

Grundy's mitigation strategy revolves around Public Law 96-367, Section 202, which authorizes the Army Corps of Engineers to construct, "at full federal expense," flood control measures in Buchanan and neighboring counties. More specifically, town officials approach mitigation as a process involving local planning and federal dollars.

The principal element in Grundy's mitigation strategy is meetings--of the council, with county supervisors, with representatives of the Corps of Engineers, and with state and federal officials. During these meetings, the participants discuss specific mitigation measures and a time frame for their implementation. For example, at one such meeting between town officials and the Corps of Engineers, the mayor presented a formal resolution containing several proposals for the Corps to consider. The proposals included constructing floodwalls; redesigning, raising, and moving bridges; reshaping the Levisa River Basin; and dredging the mouth of Watkins Branch.

These proposals had been developed during meetings of the council at which citizen participation was encouraged. The engineering firm from Marion also attended these meetings. According to accounts in the local press, the proposals were supported by the Grundy Chamber of Commerce, by local utility companies, and by a small, informal group of concerned citizens. The reporter who wrote the stories and several town and county officials all agreed that none of the proposals were considered to be controversial by area residents.

After the resolution had been presented, the Corps of Engineers agreed to study the proposals and decide which ones might warrant action. The Corps added, however, that no action would be taken for at least a year; to date, none has been taken.

Grundy officials were annoyed with the Corps' response to the town's suggestions. For example, one official complained that while the

town was ready to act, the Corps was "holding things up." Another said that the Corps was more interested in studying problems than in doing what was needed to solve them. Still another noted that dealing with Washington is almost always a problem because of the massive amount of paperwork, and because "they'll study you to death."

On another occasion, the mayor and the town's water department director met with the county administrator, several county supervisors, the executive director of an area development project, three representatives of the Marion engineering firm, and a senator's aide. The purpose of that meeting was to exchange ideas for a flood prevention program. One participant suggested that local officials would be well-advised to keep in close touch with the Corps of Engineers. Another argued that the various proposals being developed should be combined into a "coordinated program" before being sent to the Corps, and still another suggested that the Corps be invited to Grundy for additional discussions.

Clearly, town officials appear to believe that they know what mitigation measures are needed. They also appear to believe that the Corps should accept their recommendations and begin construction without further delay.

Several officials spoke of a mitigation measure that they have been discussing for more than a decade. That proposal involves rerouting the Levisa River around Grundy by making a "cut" through a mountain. The earth and rock from the cut would be used to fill the obsolete section of river bed, thereby increasing the town's inhabitable acreage. Nearly every official interviewed agreed that "moving the river" was the only permanent solution to Grundy's flooding problem. However, since the estimated cost of the project exceeds the amount of 202 funds available,

the council has not asked the Corps to study it seriously. Nor has the town sought funding from other sources.

The County Board of Supervisors has also engaged in mitigation planning. Working with the Cumberland Plateau Planning District Commission, the board has proposed relocating approximately 19 miles of State Route 460 to an area far removed from the banks of the Levisa River. Initially, seven alternative routes were developed, but the board recently selected two for the state to consider.

On March 31, 1981, a public meeting was held in Grundy to discuss the project. Officials from the State Highways and Transportation Department attended. At present, no one is sure what the state will decide. However, even the most optimistic local officials expect five years to elapse before anything concrete is accomplished.

The proposals contained in the council's resolution and the rerouting of both the Levisa River and State Route 460 are by no means the only suggestions discussed among those concerned with mitigation. For example, a local shop owner called for the construction of "hundreds of little dams" at the heads of creeks that flow through the mountains. A retired county official favored the terracing of slopes along the floodplain and the periodic dredging and snagging of heavily silted waterways. A town official supported stricter enforcement of existing flood plain regulations, complaining that neither the county nor the Corps has adequate enforcement authority. Another official also called for stricter enforcement of floodplain regulations, but added that strict enforcement probably would never happen because many of the regulations were ill-suited to the area's terrain. The official noted that most buildings would be safe from a 100-year flood only if elevated a dozen feet, and that this was such an unrealistic demand that the

county felt compelled to issue construction variances on an almost regular basis.

Finally, both town and county officials spoke of the need to encourage the area's mining companies to "level-off" the tops of mountains after the coal has been removed. They said that the level acreage could be used for relocating residents now living along the rivers and creeks. To date, this proposal has not received widespread support because the funds to bring water, sewers, and power to the tops of mountains are not available. It should be noted, however, that Grundy has constructed an airport (or, to be more precise, a runway) on the top of one mountain, and a coal company has begun construction of a residential community on the top of another. The 1,500 acre community will consist of 1,000 single-family homes, 350 trailer pads, 200 to 400 apartment units, a school, a church, and a fire station. It will also include park areas and a business district. Though the coal company's primary purpose is to house miners who work for the firm, the project is considered by some to be an excellent example of an alternative to building in the flood plain.

Since 1979, several major mitigation studies have been conducted for the Grundy area. One study was initiated by the Cumberland Plateau Commission, which hired the engineering firm from Marion to do the research. (The study was funded by a grant from a regional commission.) The firm was charged with exploring the causes of flooding, developing a sound flood abatement program based on both corretive and prventive measures, preparing an implementation schedule, and identifying possible sources of funding. According to the deputy director of the Cumberland Plateau Commission, the study stresses nonstructural measures such as protecting individual buildings by waterproofing, installing warning systems, and enforcing flood plain

management programs and zoning controls. When the report was completed, it was presented to the County Board of Supervisors and is currently under review.

A second study is being conducted by the Corps of Engineers to examine nonstructural solutions to the flooding problem. It will also examine structural alternatives, including the building of dams and bridges.

Town and county officials are very eager to develop and implement a flood program. (More eager, in fact, than many of the area's residents.) They devote considerable energy to formulating proposals and to encouraging the Corps of Engineers to adopt them. It should be stressed, however, that the Corps has the final say over what will be done, and for many officials that is a continuing source of frustration.

CHAPTER X

PIKE COUNTY, KENTUCKY

Backround

Pike County, the largest county in Kentucky, covers 780 square miles in the southeastern part of the state. The county's population is 81,000. The Tug Fork of the Big Sandy River flows along Pike County's northeastern boundary; the Russell and Levisa forks of the Big Sandy River run through the western half. The county government is headed by an elected county judge/executive. A five-member fiscal court acts as the legislative body.

Pike County's economy is directly linked to coal, with coal production virtually the only industry n the area. The few manufacturers who have located in the area make equipment used in the production of coal. Coal companies and their employees are the purchasers of the majority of local services.

Description of the Disaster

The flash flooding that occurred on the morning of July 15, 1979, in the Freburn, Phelps, and Majestic sections (approximate population 6,000 to 7,000) of Pike County was caused by a localized storm that produced between 4.5 and 6 inches of rain over a period of three hours in a seven square mile area. The storm produced flash flooding in the local streams and creeks, which in turn carried away vehicles and damaged or destroyed houses, bridges, and roadways. As a result of the July, 1979, storm, three deaths occurred and almost ten homes were either badly damaged or destroyed.

A Presidential Disaster Declaration was issued for the affected portions of Pike County on July 19, 1979. This declaration was the first instance in which federal disaster operations were coordinated by

the area's regional FEMA office. The approximate total expenditures under federal disaster programs in Pike County were: $700,000+ for temporary housing, $450,000 for individual and family grants, and $1,390,000 for public assistance.

Flooding is not an unusual event in Pike County. Because of the local topography, the entire county is vulnerable to flooding. The county's terrain is mountainous and rugged, with the only flat land in the narrow river valleys and hollows. Roadbeds, railways, and homes are built along the banks of the numerous creeks. Runoff from the mountains is fast because of strip mining activities that clear mountainsides of vegetation and build mining roads up the mountains. The runoff causes erosion, which in turn increases the siltation rate of the creeks and streams, thereby decreasing their carrying capacity. This vulnerability is a function of topography, land use, and economics. The entire county has a large network of streams and creeks that drain into two forks of the Big Sandy River.

The largest flood of record, which occurred in April, 1977, affected not only Pike County, but also 44 other counties in a four-state area and caused an estimated $200 million in damage. The flood of 1977 exceeded the 100-year level in Pike County and is looked on as the flood that raised the community's consciousness. Most of the people interviewed repeatedley referred to the flood of 1977, which struck the city of Pikeville heavily.

In contrast to the 1977 flood, the flood of 1979 occurred in the eastern section of the county in Freburn, Phelps and Majestic. The flash flood, which was contained within this small area (approximately seven square miles), was typically localized. The only level land available for building sites is also located in the flood plain, thus a

large part of Pike County's flood problem is interwoven with housing and community development problems.

An increased need for housing units brought about by the growth of the coal industry forces people to occupy homes in the flood plain. Land is extremely expensive because of the value of the mineral rights, and, as a result, the local mortgage market is extremely tight. In some cases, down payments of 50% are required, with a payback period of only 10 to 15 years. The above factors help to explain why nine out of ten new homes in Pike County are mobile homes.

The county judge had a great deal of experience dealing with the effects of floods in Pike County and was no stranger to Presidential Disaster Declarations. When asked about the flood of July, 1979, many people referred to the flood of 1977 as a great learning experience. The feeling seemed to be that if the community could rebuild after the 1977 flood, the floods since then (1978, 1979) were manageable.

At the first indication of an impending flood, the county judge convened a meeting of those people who would be involved in a possible emergency response. The group included the county flood plain manager, the county flood coordinator, the county inspection and codes enforcement officer, the executive vice president of the county Chamber of Commerce, and the disaster and emergency services director. The judge appeared to be the central actor in these meetings as well as in all county administrative activities. At this meeting, preparations were checked and coordination reviewed. In the event of an actual flood, each person has asigned tasks to be carried out. This organization appears to have evolved over the years that the judge (who recently was defeated in a bid for a third term), has been in office.

The county mobilizes its business community through the Chamber of Commerce. Although Pike County is basically rural, the Chamber of

Commerce has a full-time paid staff of three and a membership of 300 businesses. the chamber has two special standing committees to deal with the flooding problem: the Warning Committee and the Flood Committee. Among the chamber's members are some of the county's major employers, including the coal companies, even though the coal operators have their own association.

An interesting relationship was noted between the county government and the coal companies concerning response to flood disasters. Generally, the coal companies were quite helpful in providing personnel and hevy equipment for the initial clean-up following a flood. The county judge knew which coal companies would provide personnel and equipment and did not hesitate to ask for their assistance in an emergency. However, every local government official interviewed agreed that it would be improper for them to try to enlist the coal company's support in mitigation measures. Local officials were very grateful for the help of the coal companies and felt very reluctant to ask for any type of additional assistance with the flooding problem.

The judge was very successful in securing federal money in the form of general revenue sharing, CDBG funds, and Farmers Home Administration funds. In addition, the state returns a substantial amount of money to Pike County in the form of coal severance taxes (over $3 million in fiscal year 1980-81). This is particularly important because the state has instituted a Proposition 13-type cap on local tax rates and this, combined with the tightening of federal grant money, has severely limited the activities of the county government.

The judge also subscribed to a commercial newsletter that announced the availability of grant money. From these announcements, he decided which grants to apply for based on recommendations of a private consultant who is retained to write grant applications. The judge was

successful in using this approach to obtain federal grant money not only under normal conditions, but also in flood recovery efforts.

The county emergency services director was pleased with the state's response to the disaster. The only problem encountered was logistical: the lack of housing in the flood area forced the approximately 30 state employees who responded to the disaster to commute over 100 miles daily between the asistance centers and their lodgings.

Mitigation and Recovery

Because Pike County has had a long history of flood disasters, flood mitigation actions are a continual concern. While some flood mitigation projects are in response to a single flooding incident, most are of a more general nature and are in recognition that the area is extremely vulnerable to flooding.

In July, 1979, the county was in the emergency phase of the NFIP. Now in the regular program, the county has enacted and is enforcing flood plain regulations. Several mitigation actions have been taken as a direct result of the flooding of July 15, 1979:

1) No rebuilding has been allowed in the flood plain as indicated on the flood hazard boundary maps. While this is a good start, a problem has been encountered because the flood hazard boundary map does not sufficiently identify flood-prone areas. Because of the topography of this region, a majority of the flooded land was not identified as being in the flood plain. Smaller scale flood maps are needed to obtain the full benefits from the NFIP and from the new flood plain regulations.

2) A request was made for HUD Section 407 disaster funds for an alternative flood-free housing program. Initially affecting 80 households, this program is administered by the Pike County Housing Authority and is designed to eliminate the future flood damage in the flood plain.

This voluntary program provides several options: 1) nonparticipation; 2) acquisition and relocation; 3) relocation to a higher elevation on the same property; or 4) elevation of the structure in place.

Many other mitigation measures in Pike County were undertaken not as a direct result of the 1979 flood, but in response to previous floods or in recognition of the continuous hazard posed by flooding. For example, in response to the April, 1977 flood, the Central Appalachian Development Association was created to reduce or mitigate flood damages in the area and three neighboring states. Pike County has directly benefited from these cooperative efforts setting up an area-wide flash flood warning system. this system uses a combination of volunteer observers and remote sensing rain gauges linked by microwave radio to a computer in nearby Frankfort to provide accurate information on which to base flood warnings. With additional federal funds, the commission has contracted with the Corps of Engineers to perform stream rehabilitation and to clear and snag creeks in the county.

Other programs supporting flood mitigation affecting Pike County are run by the water resources division of the state national resources bureau. This division operates the Community Flood Damage Abatement Program. through this program, Pike County has been awarded state funds to create a flood insurance informational education program. A new emergency operations plan that has been written for Pike County is a result of a cooperativeeffort of the county, the state, and the Big Sandy Develoment District. This plan includes an annex covering the operation of the Flash Flood Warning System.

Interviewers' Perceptions

Pike County's flooding problems are tied to its housing problems. In the past, the lack of developable land has forced development of

flood-prone areas. The enforcement of new flood plain regulations together with better flood mapping should stop this practice. But the pressures to develop land within the flood plain will be tremendous. Community development funds to provide water and sewer service to new housing developments on flat-topped mountans would also foster flood mitigation. The innovative use of grant money will be needed to accomplish this.

At the state and local level, the new warning system should help to reduce damages in Pike County. The new Pikeville/Pike County Emergency Operations Plan, while a step in the right direction, should include more information on the vulnerability of the county to flooding and individual operational plans for when a flooding emergency occurs. In Pike County it is not a question of whether a flood will occur, but when.

CHAPTER XI

PHOENIX, ARIZONA

Background

Phoenix, one of the fastest growing cities in the United States, has a population of 665,000. Its metropolitan area houses 50% of the state's population. Phoenix is a sophisticated, well-managed community that attempts to keep up administratively with the increasing demands of a growing municipality. A pleasant climate makes tourism a major part of the local economy, and the city is currently the ninth largest tourist area in the country. Other major industries are electronic equipment manufacturing, aircraft manufacturing, sand and gravel mining, and government.

Phoenix, which is also the state capital, has the council-manager form of government, with an active mayor. It is the largest city in Maricopa County, which also encompasses Mesa, Tempe, and Scottsdale, and serves a population of 970,000. The relationship between the two jurisdictions is important because the county provides emergency management services (among others) for the municipalities within its boundaries. Maricopa County effectively coordinates activities among the local jurisdictions.

Phoenix is in a desert area; yet since 1891, the city has had a large number of severe floods. The floods can be caused by: 1) a winter storm with low-intensity rainfall covering wide areas for several days; 2) general summer storms with heavy rainfall over wide areas; or 3) local thunderstorms with high-intensity rainfall, usually of short duration, over small areas. Other factors that contribute to the severity of flooding are the levels of water contained in the watersheds

behind the dams upriver and the level of snow melt in the mountains during a rainstorm.

Organizational Actors

When flooding occurs in Phoenix, a number of organizations become involved in response and recovery activities. The main actors are the City of Phoenix, the Flood Control District of Maricopa County, the Salt River Project, the State Transportation Department, the State Disaster Preparedness Office, and the Maricopa County Civil Defense Office. The role each plays both before and after the disaster event is critical to how Phoenix copes with flooding.

Phoenix. Because Phoenix has had three major floods in the last three years, the city has acquired the ability to respond effectively. The city's emergency operating plan is written to allow individual departments flexibility in designing their response within the overall city plan. Implementation of the plan requires no new staff or procedures. Because Phoenix is the largest jurisdiction in Maricopa County, and because it suffers the most damage due to the high value of the public facilities affected, the city has a very powerful voice in recovery planning for the area.

The Flood Control District of Maricopa County. Founded in 1959, the Flood Control District is a municipal corporation and political subdivision of the state. The agency is responsible for providing structural flood control facilities within the county. The district is governed by a Board of Directors (county supervisors), with the advice of the Citizen's Flood Control Advisory Board. The district, which includes all other municipal corporations and political subdivisions within the county:

- Acts as the local sponsor of federal flood control projects designed and constructed by the Army Corps of Engineers and the Soil Conservation Service;

- Plans and constructs nonfederal flood control projects; and
- Provides technical services related to flood plain management.

Federal agencies pay the construction costs on federal projects. Land rights and relocations on federal projects are paid from the flood control tax on real property (currently 43¢ per $100 of assessed value), and half of these costs are reimbursed by the state. The flood control tax provides an income of about $12 million per year. Local (nonfederal) projects are paid for by a variety of state, flood control district, county, and city cost-sharing arrangements.

During a flood, the district operates its own emergency operations center. The staff monitors the water level of the Salt and other rivers and works with the Salt River Project in alerting the potentially affected communities as to the severity of the situation. It also provides technical assistance to all jurisdictions during and after a flood emergency.

The Salt River Project. The Salt River Project is the nation's oldest multipurpose reclamation development project. Run by landowners in the valley, it has the legal status of a municipality. The project began as a water user's association in 1903 in order to obtain a federal loan to build a reservoir that would help ease the water shortage problems in the valley. It now serves the most populated area of the state.

Since the Roosevelt Dam was built in 1911, five more dams have been constructed to provide water storage and power for the entire valley area. This system of dams has allowed Phoenix to grow and prosper, because the Salt River Project has provided a source of water and power that has grown as demand has increased.

During a flood, the Salt River Project has a number of functions. From its emergency operations center, water level and speed are monitored. It also makes the crucial decision as to when water should be released from the reservoirs to avoid topping the dams. In previous years, the Salt River Project has been criticized for not releasing water soon enough--resulting in overburdened channels and therefore causing more damage than was necessary.

State Department of Transportation. The State Department of Transportation serves as the coordinating force for the local transit authorities. In this capacity, it helps to maintain similar levels of transportation technology throughout the state. The department becomes involved after a flood primarily in helping to plan a response to a transportation emergency. The situation reaches an emergency level in Phoenix because the Salt River, which floods most severely, bisects the city and separates the downtown section from the commuter cities of Tempe and Mesa.

State Division of Emergency Services. The State Division of Emergency Services is a well-run and locally respected organization. The staff see it as their responsibility to coordinate the efforts of all the jurisdictions in relations with the federal government and to aid during response as much as possible (see later discussion on local/state relations and state involvement).

Maricopa County Department of Civil Defense and Emergency Services. The Civil Defense Office coordinates the efforts of all the groups involved in disaster response. The disaster plans of all agencies are coordinated with the county's plan, and all jurisdictions contract with the county for civil defense servces. In addition, representatives from the groups listed above, including the sheriff's office and the Red Cross, are represented in the County Emergency Operations Center during

the emergency. This allows for a better distribution of effort and keeps everyone aware of the latest information on weather, water flow, and bridge conditions.

Description of the Disaster

The rain began on February 12, 1980, as a series of major rainstorms, one almost immediately following another, moved into the state. The rain was heaviest northeast of Phoenix, in the watershed areas. The Salt River Project, which operates the dams, began releasing water from the storage areas to prevent water from topping the dams. this was a critical decision because the storage areas were at 95% capacity when the rain began. The release of water, the rain, and the heavy snow melt from the mountains continued for ten days, causing severe flooding along the Salt and Agua Fria Rivers.

Response Phase

The city/county response to the 1980 flood was as close to routine as the city officials want to admit. After having major floods in 1978 and 1979, the city and the county developed an emergency response system. As mentioned previously, the Emergency Operations Center was the control center. The county civil defense director was responsible for ordering evacuations and coordinating the activities of county organizations. These included the county sheriff's office, the Salt River Project, Maricopa County Flood Control District, the Salvation Army, the Red Cross, the State Disaster Office, and the Phoenix Civil Defense Office.

Evacuation warnings were issued beginning on February 14. Few of the communities were affected by flood warnings because there were few developments along the rivers. Some communities have worked to keep flood plain development to a minimum, even though until 1978 such development did not appear to be risky. The communities affected had

been flooded during the two previous floods so they were well-organized with flood watch captains and pyramid phone call systems. The evacuations that were required went smoothly.

The city staff responded to the disaster by giving extra hours of their time to answering the disaster hot line and whatever else was necessary. The public transit system was put on stand-by for evacuation purposes. The Phoenix emergency operations center was opened and made ready. While the county EOC did play an important role in the county-wide response to the flood, the city, through its own EOC, was solely responsible for all flood activities except shelters within the city limits.

After the flood waters receded in the affected six-county area, the total damage was estimated at $12 million. As of May, 1981, Phoenix had received $3.8 million from the FEMA to cover repair costs. It is estimated that the total cost of repairs will be $7.9 million. The majority of the damage was done to public facilities: bridges, roads, and river and channel beds. Phoenix lost all but two bridges over the Salt River, which bisects and separates the city from its southern neighbors. These bridges carry commuters from Tempe, Mesa, South Phoenix and from Phoenix. There was also significant damage to the south end of the runway at the Phoenix Sky Harbor International Airport. Projects that were part of the recovery from previous floods also suffered heavy damage.

Recovery Activities

Heavy residential damage was restricted to a few communities. Very few homes were completely destroyed, with most of the damage restricted to water in basements and damaged utilities. The dams and other water control services suffered little or no damage.

The recovery process from this flood built on the recovery processes of the 1978 and 1979 floods. The problems were already well-defined; it was now up to the city to complete or reevaluate projects that had been started earlier and to add others.

The city used the same staff and same organization for recovery from the flood as was used for daily operations. No new organization was needed. This was true particularly in 1980 as the methods and coordinating ability were already in place.

The main actors for the recovery process in Phoenix were the transportation director from the city manager's office and a junior member of the city manager's staff. These two individuals coordinated the work of the city engineers, the public transit administration and the city's relations with the state, county, Salt River Project, Maricopa County Flood Control District, and FEMA.

As the storm waters receded, the city was left with two usable bridges out of 21 that crossed the Salt River, a flooded and damaged runway at the airport, a sanitary sewer leak, renewed demands for increased flood control from the citizens, and a need for all of the jurisdictions involved to reevaluate the options for flood control.

At the heart of the recovery issue debate is Orme Dam. Many individuals in Phoenix believe that if the dam had been built, all the recent floods could have been avoided. In order to understand the city's situation, it is important to explain the Orme Dam controversy.

Orme Dam and Its Alternatives

Orme Dam was to be built at the confluence of the Salt and Verde rivers to the east of Phoenix. A proposal for a dam at that site was made in the 1940s and was negotiated throug the decades until authorized by Congress about 1976.

Phoenix planners, hearing that Orme Dam was to be built, fell victim to long-term planning. The plans for the bridges and airport were designed on the assumption that the dam was to be built. this assured the city that the Salt River would have a flow of no more than 50,000 cubic feet per second (cfs) at any time. However, in 1977, Orme Dam was a victim of President Carter's water project hit list, which generated considerable controversy. When the debate became intense in Washington, President Carter commissioned a study to determine if Orme Dam was the correct, most cost-effective, and fairest method of flood control. The study came out against the dam. Many charged the administration with foul-play, but the study's findings held. The search for the proper alternative began.

Conservationists oppose Orme Dam because they claim the nesting grounds of the southern eagle will be destroyed. The Audubon Society says there are six pairs, the Draft Environmental Impact Statement indicated only one pair. Dam opponents also claim that there is a serious geologic fault in the area; the Bureau of Reclamation denies this. Others believe the alternatives, primarily a system of channels and levees that make up the Central Arizona Project's Arizona Canal Diversionary Channel (ACDC), which is to be completed in 1991, will be more cost effective.

Another controversy surrounding the Orme Dam site is that the reservoir (watershed) behind the dam will flood a majority of the Fort McDowell Indian Reservation. The Indians claim the lake will cover a historic burial ground; the planners deny this. The Indians also say they would have to relocate 325 residents to other parts of the reservation. The Indian reservation bordering Fort McDowell would have a minor portion of its land affected, but opposes Orme Dam in support of the neighboring tribe.

The most recent argument against the dam comes from the "tubers," those who use inner tubes to go down the Salt River rapids. It is estimated that there are 10,000 tubers a day during the season. They vow to fight the dam, citing that it will ruin their low-cost recreation.

The supporters of Orme Dam believe it is the most efficient and the only way of providing flood control for the Phoenix urbanized valley. They understand Indian concerns, but counter that relocating a small number of people is better than spending millions of dollars to reconstruct bridges and airports--not to mention the hundreds of people the flood will drive from their homes, who in turn will lose thousands of dollars in productive time because they are unable to get work.

Currently, there is a study being conducted by the Army Corps of Engineers and other groups to choose the best alternatives for controlling flooding in the Phoenix area. The recommendations of the Orme Dam Alternatives Study Committee were due in October, 1981. The majority of the people interviewed felt Orme Dam would be the alternative selected as it was the only alternative that would provide all the necessary protection. However, others who approved the dam in theory were doubtful that it would ever be built. They realize that the original estimated cost of $400 million will be much higher by 1982, making the cost-benefit ratio less appealing to the Corps of Engineers or the administration.

Recently, another point has been raised in discussing flood protection. The Corps released a series of seismological safety requirements for dams. A careful inspection revealed that none of the five dams upstream passed the strict requirements. This development, according to a Corps representative, is not being considered in the study of Orme Dam alternatives. He believes this deliberate oversight

will cause a delay in the release of the alternatives report aswellas in the resolution of the issue. This problem cannot be ignored when the overall plan for flood control is put into effect.

The Orme Dam or an alternative is needed in order to prevent further flooding; everyone agrees on this. Currently, everything being constructed downstream is considered temporary because whatever structure is put into place will have different effects. Communities in the Phoenix metropolitan area are forced to make recovery decisions that may lead either to overprotection or underprotection of their public facilities and residents, depending on the final outcome.

The other alternatives being studied are expanding the ACDC; floodproofing all of North Phoenix by building a series of earthen dams and levees, greenways, and channels; raising the Roosevelt Dam 15 feet to allow for more water storage; constructing a new cliff dam on the Verde River; constructing a new Stewart Mountain Dam; building a new Waddell Dam; reregulating the Salt River Project; or establishing a water exchange project with the Salt River Project.

A Maricopa County supervisor has indicated disapproval of the ACDC Channel, claiming it will require relocating twice as many people as Orme Dam. Specifically, 700 people, 44 businesses, and 784 parcels of land would be relocated by the channel as opposed to 325 Indian residents for the dam. Some flood proofing is already being done in North Phoenix, but the amount would have to be increased significantly. An engineer with the Corps explained that the Roosevelt Dam is not strong enough to support an increase in height, and will probably have to be completely rebuilt. He suggests the money for Orme Dam should be used to build an enormous dam just below the Roosevelt.

Business Community

According to the Phoenix transportation director, the business community and civic leaders have been actively in favor of flood control. The local papers have spoken in favor of some structural measure and of raising the flood control tax in Maricopa County to pay for the improvement. Three industries are directly affected by the lack of flood control--the sand and gravel industry, the airlines, and the tourist trade.

The sand and gravel interests, located along the Salt River, own both the banks and the river bed. Whenever there is severe flooding, they lose equipment as well as many days of productivity. The businesses, however, have been willing to cooperate with the city to try to correct the situation. This spirit of cooperation is evidenced in a number of projects, including the airport diversion channel that is being built around the airport to help control the flow of the river and to protect businesses and runways.

Transportation

Short term. During the first week after the storm, Phoenix had only one bridge out of 21 that was structurally sound. Some had been destroyed; others needed new approaches or other major reconstruction. The interstate bridge needed minor repairs before it reopened shortly after the storm. The traffic over these two bridges, which increased from 30,000 average daily trips to 100,000, caused severe congestion on the approaches and raised questions as to the bridges' capacity to withstand the additional stress.

The city took responsibility for all the traffic reduction measures, except the Amtrak train. Those measures included: park-and-ride lots with express bus service downtown, car pool and bus express lanes on the bridges, reverse lanes during rush hours, specific access

streets for buses only, and the opening of a four-car Amtrak train that operated for a short time between Tempe, Mesa, and Phoenix. The state made the arrangements with the city to have the city buses meet the train and take passengers to a transfer point.

Long term. The four-car Amtrak train no longer runs, the barricades are down, but there are still bridges to be rebuilt. The absence of any bridges across the Salt River is a major concern to officials of Phoenix and other jurisdictions. The public has not forgotten the traffic jams of 1980, as reflected in public approval of a recent bond issue for bridge construction. Seventy-five percent of the voters agreed to spend $63 million for the building of bridges able to withstand 200,000 cfs and for the access roads and sewers to accompany them. The Corps of Engineers feels this is overkill, pointing out that a bridge of 200,000 cfs will withstand the 100-year flood, but will be very expensive to build. When additional flood control measures are constructed, according to the Corps, there will be no need to have such large bridges. One city official interviewed said the city should build bridges of different capacities.

The commuting patterns of residents have not changed dramatically. The state government, however, is still advertising the importance of car pooling, and the city is providing reverse rush hour lanes. The public transportation director did note an increase in bus ridership since the flood.

A major benefit of the storm for the assistant director for the state'stransportation department was better working relations with the city and the county. The official indicated that the department had developed a more sophisticated contingency plan. He also felt the efficacy of the short-term Amtrak route had helped citizens to realize

the possibility of light rail vehicle transportation in the metropolitan Phoenix area.

Airport Channel

In the 1978 flood, the Phoenix airport was badly damaged. Most of the southern runway, which was located in the flood plain, was under water. If adequate flood control measures were not introduced, the airport would have to relocate in order to expand to the capacity originally anticipated in the master plan. Estimates for this move have gone as high as $1 billion.

A study commissioned after the 1978 flood resulted in a proposed $10 million project to channel the Salt River in the vicinity of 15th Avenue, with funding provided by the state, the City of Phoenix, and the Federal Aviation Agency (FAA). In April 1979, the State Legislature approved $4 million for the project. In May, 1979, voters approved bond issues that would provide the bond funds required for the city's share. FAA representatives have indicated that federal funds would be available for acquisition of a portion of the required right-of-way for the project. The design flow is 176,000 cfs, with three feet of freeboard. The city consultant reports that a flow of 250,000 cfs would be contained within the channelized area with zero freeboard. FEMA has hired a consultant to evaluate the stability of the channel (see later discussion on relations with FEMA).

As the work began, problems arose. Part of the area to be excavated was a landfill that had been closed years before. The EPA required the landfill be moved in order to avoid a health hazard. There was also a hazardous materials dump that had to be removed at a cost of millions of dollars. A Corps engineer predicts that this interim channel will disappear within one to fifty years, depending on future

flooding, and it will not alow the full expansion of the airport as the planners hope.

Relations with FEMA

Phoenix has had a lot of experience with FEMA and FDAA, its predecessor. All the officials interviewed prefaced their comments on FEMA by saying they appreciated the substantial amounts of money received to rebuild and repair the community. They admitted they could not rebuild using only local revenues. Each, however, had a particular complaint, which frequently was about the new regulation requiring communities to pay for 25% of the recovery cost. This was a requirement for which the locals were not prepared. The officials emphasized that if Phoenix had another major disaster the city would not have the funds to contribute the 25%. One official, who showed us 11 inches of paperwork that were required to be kept for each disaster, stressed there must be some way to reduce this volume. FEMA was also acused of being narrowminded in its view of mitigation; the official thinks FEMA should have accepted Orme Dam as the supreme mitigation project.

Another complaint voiced frequently was about the delays in beginning the audits. For Phoenix this is a significant problem because the city had three floods in three consecutive years. Officials indicated the difficulty in keeping each flood separate in their minds, let alone in the paperwork. Expenditure records are difficult to maintain and substantiate from the earlier floods. A FEMA examiner wanted to see the results of a bridge repair from the 1978 flood; this was difficult because it had been destroyed in the 1980 flood. Rather than have audits to determine the amount of money a city should receive as a reimbursement, one local official thought the federal government should give the community the necessary amount to complete all the repairs and then audit for any refund due to the federal government.

The official was willing to take the chance that everything would be done correctly and none of the money would have to be returned.

Another official noted the change in attitude in the FEMA staff between the 1978 and the 1980 floods. In 1978, FEMA was receptive, encouraging, and helpful; in 1980, the representatives took on a disinterested, almost hostile attitude. It appeared as though FEMA wanted to see how little funding could be given and as uncooperatively as possible. The city was especially displeased with the lack of technical expertise exhibited by the 1980 FEMA representatives.

Phoenix officials were particularly disturbed about several instances when FEMA disallowed or questioned proposed expenditures. In the vicinity of the airport diversion channel, a sewer main broke during the flood that caused concern over the safety of the drinking water. Because the city felt there were no adequate safeguards to preclude this kind of damage, local engineers were instructed to put in a sewage bypass sytem. The city viewed this as a mitigating effort; FEMA questioned the work, saying it was unnecessary and too expensive.

A second disallowance was the cost of overtime for public transit bus drivers. During the heaviest flooding, public buses were put on standby to evacuate residents in low-lying areas. Extra buses were used to shuttle passengers from the commuter train, which stopped at a previously unserved location, to other parts of town. The city also provided new routes to eliminate heavy traffic congestion. FEMA disallowed all of these costs because public transit was a service provided by the city on a regular basis. FEMA explained that Phoenix would have been reimbursed had they hired an outside private contractor to provide the same service.

This bias against the city staff also became apparent when FEMA allowed overhead expenses for contractors, but not for the city

employees. FEMA also did not approve expenditures for a phone bank that the city operated for two weeks after the disaster. Operated by city personnel who volunteered or worked overtime, the phone bank served as a rumor control center and helped the citizens become aware of the local situation. They city felt this was not a service provided under normal circumstances and should be recognized as such.

FEMA did spend $70,000 to double check data on the Salt River flood and channel for designing the airport diversion channel that had been collected by Phoenix city engineers and a private consulting firm. The city and firm felt the additional work was unusual and unnecessary. Local officials also found distressing unrealistic requirements for mitigation. As one official explained, he felt personally competent to determine whether a facility that had been damaged required extensive mitigation measures during rebuilding or simple replacement. He commented that often the costs of mitigation measures relative to the value of property saved were too great, when compared with chances of the severe flooding occurring again. The unfavorable cost-benefit ratio essentially precluded doing expensive mitigation work.

The overall good relationship the city had with the Federal Highway Administration made the experience with FEMA particularly disappointing. The agency funded bridge reconstruction and moved quickly on the reimbursements. City officials also noted the poor coordination among federal agencies in their regulations on funding procedures and eligible activities. Particularly annoying was the difference in flood plain delineation between the Corps of Engineers and FEMA.

Local-State Relations and State Involvement

After the 1980 flood, relations between the state and Phoenix began poorly when the state disaster coordinator designed a payment schedule

that required the city to pay a portion of the recovery costs for public facilities.* The city was not prepared for this increased cost, and no contingency funds were available for this purpose.

Despite the initial dispute with the governor, the Phoenix officials were very complimentary about the State Office of Emergency Services and the designated state representative. The relations between the state representative and the Phoenix and Maricopa County disaster representatives were good because they had worked together before and understood many of the potential problems and solutions.

The state took the position that the community would benefit if the state did the preliminary work on as many application forms as possible and discussed all funding issues with the community officials before approaching FEMA. The state felt this would serve as a way to reduce delays in processing the applications.

State officials also had difficulties with FEMA, and were especially discouraged by the slow approval process, cumbersome regulations, and excessive paperwork at all levels of government. At the time of writing, the state is still waiting for action on ten Disaster Survey Reports. Last spring, the region had at least three major disasters, which compounded the problems for everyone concerned. The state agrees with the city that audits are conducted too long after the disaster, and has recommended they be done during the recovery.

Transportation was the main area in which the city and the state coordinated activities. The city and state have now prepared

*The actual wording of the agreement stated that the first $500,000 would come from FEMA. From $500,000 to $1 million, the community would pay 10%; anything over $1 million, the community would pay 25%. The agreement was made for all communities in the affected area, not just Phoenix. The state was required to pay 20% of all FEMA-sponsored state projects.

contingency plans on how to coordinate future disaster activities to benefit both parties.

Mitigation Measures

Phoenix officials want to have mitigation measures of almost any kind in order to minimize the damage from future storms. In the past, all building has been predicated on something being constructed as a flood control measure upstream. Any mitigation work that might have been prudent has been prohibitively expensive. One Phoenix official estimates mitigation projects have been as much as eight times more expensive than rebuilding, and the city could not afford this expense.

All of the projects described in the recovery section are aimed at mitigating the effects of flooding. The community is faced with a Catch-22 problem: does it overbuild and survive until the Orme Dam or an alternative is constructed, or does it build "temporary" structures and wait with crossed fingers until the dam or an alternative is completed?

Public Works

To prevent washout of waste material, pollution of groundwater, and pollution of surface water from inundation by a 50-year flood at the city's landfills along the Salt River, Phoenix has hired a consulting firm to recommend measures to provide permanent protection against erosion and flood damage. Definite implementation dates will be decided after staff review. In the interim, plans and specifications are being prepared to award a contract to replace the protective berm at the 7th Street landfill and cover material at another landfill, both of which washed out during the February, 1980, flood.

To mitigate flood damage to water and sewer lines (which flood waters have exposed in the past), the city plans to construct protective

barriers. These barriers will consists of heavy riprap or gabions, aggregate material, and steel piles.

To mitigate flood damage to the city's sanitary sewer system, Phoenix is replacing all damaged manholes with watertight, tied-down frames and covers. The manholes are structurally reinforced to minimize damage from flood debris.

Bridges

Three new bridges planned are designed to handle flows of at least 180,000 cfs and not obstruct the 100-year flood flow. Either drilled caissons or steel pile footings will be used to resist scour. Channelization upstream and downstream from the structures and also diking and bank protection (tying into landfill protection) will be the results. The 24th Street bridge is financed by city funds supplemented by a $1 million appropriation from the state legislature in May, 1980; the other two bridges are funded by Emergency Bridge Replacement Funds of the Federal Highway Administration.

Consulting firms have been selected to design replacement bridges for both the 7th Street and 35th Avenue crossings. The actual capacity cannot be determined at this time; however, they will meet federal regulations that prohibit obstructing the 100-year flow to the extent that upstream water surface elevations are increased. These bridges will also be funded by Emergency Bridge Replacement Funds of the Federal Highway Administration.

Relocation

After the December, 1978 flood, the state signed an agreement with FDAA that required it to consider mitigation measures to prevent future flood damage; FDAA recommended relocation. Maricopa County now has a substantial relocation program that is moving several entire communities (both residential and commercial properties).

In March, 1979, the state received a Title IX grant from the EDA to provide money to pay the salary for a disaster recovery coordinator. This person secured a $1.7 million grant from the Secretary of Housing and Urban Dvelopment's discretionary fund and targeted three communities in the pilot project.

In April, 1979, the Corps of Engineers became involved, using a Section 205 Small Project Authority grant for nonstructural flood control. Corps involvement allowed the HUD money to be allocated to two other communities.

The state also became a part of the project by starting a land exchange program. Under this legislation, a land owner can exchange flood-prone land for "safe" state-owned land. As of 1980, about 60 families had taken advantage of the exchange. In addition, the Section 1362 program of the FIA has been used by eight homeowners at a cost of $370,000.

In a much larger community, where 450 residences are affected, the residents were not eager to leave the existing spacious homes on large lots. They regarded relocating as the last alternative and wanted every structural measure tried first. The residents had invested $300,000 in a dam that burst during the 1980 flood.

Since the February, 1980 flood, the project has taken on four additional communities.*

Emergency Management Capability and Civil Defense

Phoenix has made a noticeable attempt to update its emergency plans after each disaster. The city has designed a framework in which each department can handle the emergency its own way, but within certain parameters to maintain consistent operation with the county.

*For more details, see the Division of Emergency Services' "Relocation Program," Phoenix, April, 1981.

The Maricopa County Civil Defense Office is an example of good civil defense preparation. The director, a jovial person who is proud of his work and the operation he runs, is prepared for almost anything and has plans to prove it. The county and other agencies, such as the Flood Control District and the Salt River Project, have formed an association to establish a sophisticated system for predicting floods, monitoring water levels, and helping flood-prone communities prepare for a disaster. Maricopa County has also added a new phase to its civil defense plan--flood fighting. Because of the lack of adequate protection upstream, the county feels this is the only thing to do until flood control is provided.

Another reason the civil defense office operates smoothly is that all levels of government cooperate. This is particularly true in receiving money. If a city declares an emergency, but the county does not, the city will not be able to collect any disaster funds from the state. It is also true in the completion of federal forms. All departments and levels of governments participate in completing the forms before they go to the federal agency.

There are a number of people involved in civil defense and emergency mangagement in Phoenix. Since they see it as an integral part of their work, many staff members gain experience in emergency management, and the skills are not lost as the staff changes.

Ordinances

The city's flood plain ordinance, which has been approved by FEMA, provides for regulation of all new development and reconstruction of structures damaged more than 50% in flood plain areas. Flood damage to developments built after the initial adoption of the ordinance in 1974 has been extremely small. In fact, it amounts to only a few hundred square feet of an industrial parking lot. Permission was refused owners

seeking to rebuild several small businesses constructed prior to the ordinance that were substantially damaged in recent floods.

The flood plain ordinance is tied to the flood insurance maps supplied by FEMA. By state law, the benefited area below any flood control project must be redefined within 120 days after its completion. The Salt River channelization would qualify as a flood control project and therefore would have to be defined within this time frame.

Public Awareness

In the past, Phoenix has mailed brochures to its water customers informing them that flood insurance is available to all residents. Flood insurance is also a major emphasis of the state, which has a major program to have flood insurance available in every community. The city has published flood plain maps in the newspapers, established a Floodplain Management Office, and made presentations to real estate and insurance groups. The city has requested detailed operations plans from sand and gravel operators in an effort to minimize problems from future operations.

At the present time, owners of property located in a flood plain are being notified that any future development or modification to existing structures will be subject to regulation. All these efforts are geared to publicizing the existence of flood hazards and the city's intention to minimize future damage through regulation.

The city is investigating the feasibility of constructing a movable model of the river to help estimate potential erosion and degradation of the river in future flood events. This information will enable more flood-resistant design of new public facilities, and provide a valuable tool to regulate sand and gravel mining.

Interviewers' Perceptions

Phoenix is in a unique situation because it faces the problems of drought and severe flooding annually. Both of these issues have become highly political and involve all levels of government. The Phoenix metropolitan area has grown tremendously in spite of its water problems. The city has been continually forced to adapt each change in policy, each new technological advance, into its master plan, political life, and daily operations. Phoenix has not tried to ignore the problem, but rather to take each development in stride and do as much mitigation work as is possible.

From all indications, the city has coped well. Phoenix has adopted many mitigation measures as part of its public works budget, enforced strict ordinances on building in the flood plain, encouraged homeowners to purchase flood insurance, built bridges using new technologies to withstand high capacity, worked with other jurisdictions to coordinate land use decisions to promote greenways, and developed a workable system within the city and with other jurisdictions to respond effectively to disasters.

CHAPTER XII

MARIN COUNTY, CALIFORNIA

Background

The San Francisco Bay Area is composed of ten counties: Sonoma, Marin, Napa, Solano, Contra Costa, Alameda, Santa Clara, San Mateo, San Francisco and Santa Cruz. The Bay Area has had great population growth during the last 20 years. There are approximately five million people in 7,500 square miles. Land uses vary significantly throughout the counties. San Francisco is the center of commerce, culture, employment, and population. Solano, Sonoma and Santa Cruz Counties are mostly agricultural with related residential and commercial activity. Santa Clara County is the hub of the electronics and computer industry; San Mateo, Contra Costa and Alameda Counties are mixed residential and industrial. Marin is primarily residential.

Hydrology and Flood History

Periodically, the Bay Area has damaging floods. These floods are usually of riverine origin and affect flood plain lands adjacent to the streams. Combinations of high tides, winds, and intense rainfall have caused coastal flooding in areas of San Francisco Bay and Santa Cruz.

There was extensive flooding throughout the Bay Area in 1955 and 1958, and in parts of the region in 1940, 1952, 1963, and 1964. Losses from the four latest floods were about $23 million in 1955, $14 million in 1958, $4 million in 1963, and $17 million in 1964. Generally, annual flood losses have increased as a result of increased property values, runoff caused by development, and occupancy of the flood plain lands.

Governmental Complexity

The San Francisco Bay Area is one of the most governmentally complex of any of the nation's metropolitan areas. An estimated 85% of the region's population lives in the Bay Area's incorporated cities. The region's cities and counties do not provide all local governmental services. Like the rest of California, the Bay Area has a large number of special districts--more than 1,200 in the region. Roughly one-quarter of the Bay Area's special districts have environmental management or development responsibilities (see Attachment A).

In urban counties, cities provide most municipal services: police and fire protection, street maintenance, sewers, parks and recreation facilities, building inspection, emergency planning and management, and many other services and regulatory functions. Counties provide many municipal services in unincorporated areas directly and through special service areas. Most counties have flood control districts. Independent special districts may provide still other municipal services to local agencies.

Local government has traditionally relied upon urban growth and economic development to increase revenues in order to provide governmental services. The cost of government has risen markedly in recent years, but revenues have not kept pace. Since the passage of State of California Propositions 13 and 4, local officials are increasingly concerned about the costs of public programs and the ability of local governments to provide adequate services with significantly reduced resources.

Description of the Disaster

As the new year of 1982 approached, the San Francisco Bay Area became the victim of two colliding jet streams. These air masses remained stationary for about 30 hours, from January 3 to January 4,

1982, producing moderate to heavy rainfall, ranging from 15 inches in portions of Marin County to nearly 25 incnes in the Santa Cruz Mountains. Preliminary reports indicate rainfall rates of one-half to one inch per hour along the southwest slopes in Marin and Santa Cruz Counties, and one-tenth to one-half inch per hour elsewhere. On January 4 and 5, heavy rains added moisture to the upper levels of soil faster than percolation could take place. Where steep, unstable slopes existed, the fluidity of the saturated soils, and the great weight of the rainwater in the soil caused the waterlogged soils to collapse.

Over two feet of rain fell in some areas south of San Francisco. Each acre of the wettest slopes received a rainfall mass which totaled in excess of five million pounds, and the consequent stress on the slopes caused numerous landslides. Although extremely high water was reported in numerous local streams, flooding alone was not the worst problem. The combination of flooding and slope failure caused most of the damage.

Damage Caused by the Flood

The most severe damage was in the hills of the coastal range, where landslides and mud and debris flows destroyed many homes. Most damaged structures were in known (i.e., mapped) flood plains or near the mouths of canyons, but many homes located in the higher reaches of canyons were affected as well. Approximately 1,500 people needed temporary housing.

Many neighborhoods and communities were isolated when access roads were either washed out or covered by slides. Thousands of Marin County residents were stranded in San Francisco when Highway 101 was closed by slides. The community of Inverness (Marin County), population 1,200, was isolated for several days when numerous slides covered the road into the town. Five hundred homes were inaccessible in the San Lorenzo River Valley area (Santa Cruz County), because their only access road was

damaged. It was estimated that 1,000 residents in Brookdale, Boulder Creek, Felton and Scotts Valley (Santa Cruz County) were isolated.

Thousands of people were evacuated from their homes for fear of injuries or deaths due to slides or flooding. Six hundred people were evacuated in Sausalito (Marin County) after a slide killed one person, destroyed two homes, and threatened dozens more. One hundred families were evacuated in Boulder Creek (Santa Cruz County) due to the danger of more slides and flooding, and two hundred residents in Pescadero (San Mateo County) were evacuated due to dangerous flood waters.

Phone service was disrupted throughout the entire disaster area for several days and even longer in some areas. Water systems were badly damaged in the city of Santa Cruz and in the Inverness area of Marin County. Water rationing was in effect in these areas, which meant that many non-essential businesses and industries were shut down. Many businesses were damaged by flooding or slides, or were closed because the employees could not get to their jobs. Some, particularly in San Anselmo, never reopened.

On January 6, the governor requested that a major disaster be declared in the State of California. On January 7, the president determined that damages from severe storms, mudslides, high tide and flooding were of sufficient magnitude and severity to warrant a major disaster declaration under PL 93-288. Solano, Sonoma, San Mateo, Santa Cruz, Contra Costa, Alameda and Marin counties were declared for Individual and Public Assistance. Humboldt, San Joaquin and Santa Clara counties were declared for only Public Assistance. The Small Business Administration declared Lake, Mendocino, Napa, Sacramento, Monterey, San Benito, San Francisco and Yolo counties disaster areas for the SBA program.

Joint federal and state damage estimates indicated that 6,300 residences were damaged, of which 231 were destroyed. Dollar estimates of damage were $109 million to public facilities and $172.4 million to private property. There were 33 deaths, 24 due to landslides and mudslides.

Since so many localities were affected, two counties--Marin and Santa Cruz--were selected to serve as examples of the recovery process (see the next chapter for discussion of Santa Cruz County). These two counties were selectd for several reasons:

1) Given the significant responsibilities and powers of counties in California, the county unit was selected rather than a city.

2) The two counties chosen offered a wide spectrum of geographic and topographic characteristics and of city-county arrangements and relationships.

3) According to several federal and state officials interviewed over the telephone before the field visit, these two counties showed significant variations in their recovery efforts (at that time). Therefore, it was expected that they would provide contrasting examples.

While city officials within each county were interviewed, the focal point of the following two studies is the county government--its functions and responsibilities during and after the disaster. It sould be noted that in California, counties are legal subdivisions of the state and serve primarily as administrative agencies for the state. Principal county functions include general government, protection of persons and property, health and sanitation, roads and bridges, recreation, welfare and corrections, and land use planning. The county's jurisdiction is over the unincorporated areas only for some of these functions, and over the entire county for others (such as health, sanitation, welfare, and corrections).

Marin County

Marin County, California, is primarily a suburban residential and recreational area, although ranching and dairying are still carried out in the rural, western portion of the county. Industry in the county includes metal fabrication, printing, boat building, and the manufacture of plastic products, integrated circuits, missile components, cosmetics, candles, and cheese.

One of the nine counties that compose the Bay Area, Marin is linked to San Francisco by the Golden Gate Bridge to the south, and to the East Bay by the Richmond-San Rafael Bridge. It is bordered on the north and northeast by Sonoma County and to the west by the Pacific Ocean. Within the 521 square miles of Marin, a wide variety of topography, climate and vegetation exists. The combination of mountains, sea and climate has made the county a recreation spot for the entire Bay Area. Approximately 93,600 acres divided among federal, state, and county lands are devoted to recreation.

The county seat is San Rafael. Incorporated cities are Belvedere, Corte Madera, Fairfax, Larkspur, Mill Valley, Novato, Ross, San Anselmo, San Rafael, Sausalito, and Tiburon, with a combined population of 154,000. Another 63,000 people live in unincorporated areas, mostly in western Marin County. Additional legal entities that operate within the county are special districts. Details about those districts, as well as the regional agencies that exercise some control over Marin County, are provided in Attachment A.

Recent Disaster History

Marin County is chronically at risk from many natural hazards, notably flooding, mudslides, landslides, and earthquakes. In early 1982, the rains were of varying intensities and quantities in areas within the county. The City of Petaluma in Sonoma County had roughly a

250-year flood, while the Inverness area had about a 140-year flood. Other areas within the county experienced lesser impacts. The nature and impact of the flooding varied widely as did the mudslides and mudlows. Professional geologists were surprised by the type (surficial), speed, and location of some of the mudslides, mudflows, and debris avalanches. Given the unusually large amount of rainfall within a short period and the great number of mudslides (unusual for northern California), such incidents were the "disaster of record" for many areas.

The disaster was not a one-time occurrence; mudslides continued for months after the early January rains. In addition, the mudslides were (and still are) a contributor to landslides. The fact that the disaster happened over a long period of time became important in dealing with FEMA, whose enabling legislation for public assistance does not adequately allow for a continuing disaster event.

Recovery Activities

To reduce the confusion over terms and definitions, the project staff used the following definition of recovery (which was made explicit to persons being interviewed):

> The long-term recovery or reconstruction process is characterized by attention to rebuilding and new construction; restoration of major urban services; and review of predisaster land uses, especially insofar as they include consideration of local hazards in the recovery plans for the affected areas. Many persons (especially researchers) tend to think of recovery as a linear process; yet, in fact, long-term recovery begins at different times in different places for different activities.

Added to the usual difficulty of identifying when the long-term recovery activities begin, the mudslides after the disaster was declared and the continuous debris removal made the transition from the response to the recovery phase even harder to pinpoint. Several county officials

viewed the beginning of the recovery phase (per our definition) as several points in time, depending on the segment of activities being addressed--e.g., public property reconstruction, road restoration, or creek cleaning.

The project team found it difficult to identify the **local** public priorities from among the array of recovery issues and problems that arose during the aftermath of a disaster. Those difficulties were compounded by the new, strong federal presence and involvement in selecting priorities for mitigation in those cases where a Federal Hazard Mitigation Team was appointed. With the advent of the Federal Interagency Hazard Mitigation Team, a different cast of actors and a short time-frame for mitigation decision making was introduced. In Marin County, the two priority sites (Corte Madera Creek and Inverness) were identified for attention in the report prepared 15 days after the disaster. From interviewing county officials, it was clear that while the team had identified its priorities, those sites were not necessarily the priorities local officials would have selected.

Further, there was often disagreement about how easily an identified priority problem could be solved. For example, the Flood Control Zone of the Corte Madera Creek area covers the cities of Fairfax, San Anselmo, Ross, Larkspur, and the community of Kentfield, all of which suffered serious damage after the heavy rains in early January. After many years of discussions and planning for this flood-prone area, a structural solution had been decided upon. The U.S. Army Corps of Engineers had supported a structural flood control project, known as the Corte Madera Project; however, completion of the multi-million dollar project was stopped by local protests when it was three-quarters completed. The Corps estimated that the project in its unfinished form was only one-third effective. They believe that if the

project had been completed as originally designed, there would have been little or no damage downstream of San Anselmo.

As would be expected, the Hazard Mitigation Team picked this unfinished flood control project as a priority mitigation effort for Marin County (this will be discussed later in the section on mitigation). The cost of completing the project ($600,000) was seen as nominal by federal officials, who reasoned that the dollar amount was less than the cost of two or three homes in this large, affluent county. The interviewer's perception of the county official's viewpoint was that the county government had incurred only $60,000 in damage to public property during the very severe storm; therefore, why should it invest $600,000 to prevent future possible damage or losses? Finally, citizens in several local jurisdictions within the Corte Madera flood control district objected to raising the funds, because they reasoned that since only a relatively few property owners had major damage or loss, a large number of citizens should not have to pay the taxes required to raise $600,000 when they had not been (nor were likely to be) affected by flooding.

Damage in the flooding/mudslide events was concentrated in residential or non-commercial areas. This minimized the role of most of the business community. Local heavy equipment contractors and construction firms were a notable exception. Their equipment and crews were dedicated to emergency activities and numerous restoration projects. The involvement and role of ad hoc citizen or interest groups did not appear to be significant. Nevertheless, existing citizen groups, such as taxpayer groups in the Corte Madera project area or established environmental groups in the Inverness area, were active in championing the causes for which they were created. The focal point of interaction during the recovery planning period was between the county

and federal officials, although state officials were involved throughout.

City-County Relations

While only one city administrator in Marin County was interviewed, it appears that city-county relations were good during and after the disaster. The county, for the most part, dealt with the state on behalf of the communities within its boundaries. The city officials interviewed thought that the city-county relationship was positive.

The good city-county relations during and after the disaster were an extension of the good intergovernmental relations during normal times. Generally, the city and county officials have regular meetings, telephone contact, and communications. During the disaster, the organizational interaction between these two levels of government was thought to be good. For the first few days after the main flooding, each municipality used its equipment and personnel to take care of its own needs; then each shared what it could with other jurisdictions.

Officials in the city of San Rafael commented that the regular interaction among city and county officials that is cultivated during normal times continued during the emergency, which means they were not fighting out jurisdictional problems while battling the disaster.

It should be noted that the researchers did not devote much time to the local preparedness plan or to the city-county emergency management activities for this disaster, since the mud- and landslides were very unusual. It was assumed that the unusual number and nature of the slides created needs and problems not covered by existing preparedness plans. It was further assumed that the emergency response actions had less bearing on the recovery planning activities than is true in other types of natural disasters.

County-State Relations

The county's perception of the state's role was positive, generally. State activities in the affected localities varied from the direct assistance of the National Guard, to the advocacy of local needs to the federal officials. At the same time, the state aided the federal government by explaining, or seconding, federal insistence on mitigative steps by local governments. Since the state is the co-signer of the federal/state agreement required by a Presidential Disaster Declaration, all local paperwork and requests must go through the state. This protocol is sometimes considered onerous by local officials.

Shortly after the Presidential Declaration was issued, the state geologist made several suggestions for state legislation and actions:

1) Creating landslide-protection zones along the coast, in which particularly stringent building requirements would be put into effect and remedial measures taken.

2) Undertaking a comprehensive "critical area and slope stability investigation" statewide to pinpoint land- and mudslide-prone land.

3) Requiring mandatory notification of prospective homeowners and apartment buyers of potential stability problems.

The geologist further commented that his department had "shelved a landslide hazard prevention legislative package because of the administration's across-the-board fiscal retrenchment late last fall." It appears that the California Division of Mines and Geology, which has responsibility for hazard mitigation (as required under Section 406), is aware of many needed actions to reduce the landslide hazard. Nevertheless, that agency's ability to "encourage communities to adopt and implement land use regulations, construction standards and emergency plans in unstable slope areas" remains problematic, according to the Hazard Mitigation Team's first progress report.

Marin County is heavily dependent on income from property taxes and from state and federal transfers. In addition, the county has the unusual resource of the San Francisco Foundation, a private foundation with a special trust fund dedicated to the benefit of Marin County. After the disaster, the county and cities received about $3.5 million from the Foundation, which the county and cities primarily used as the local share of disaster assistance grants.

As a general charter county, Marin County has the usual local authorities and power of counties in California. As is true of all other municipalities in the state, it is subject to the limits of Proposition 13 with regard to raising revenues. Under that requirement, a taxing measure must be placed on the ballot for voter consideration and must receive a two-thirds vote to be sustained. Needless to say, very few of the tax-generating measures are passed. This fact makes it unlikely that many of the flood control and other hazard mitigation measures needed will be achieved when extraordinary revenues are required.

County-Federal Relations

County officials, particularly those engaged in preparing and reviewing the Damage Survey Reports (DSRs), had numerous difficulties in dealing with FEMA staff or their designees (disaster reservists). Since the county had about 300 sites for which DSRs had to be prepared, there were many opportunities for disagreement. The conflicts stemmed from definitional questions over mudslides vs. landslides (which are not covered under the National Flood Insurance Program (NFIP)) and what constitutes repair vs. permanent restoration. The county and federal officials also argued about legislative intent for the public assistance provided by FEMA and about engineering estimates.

The county officials were very dissatisfied with the process of preparing DSRs and with FEMA's disposition (or lack thereof) of the DSRs. The research team thought that at the heart of many of the disagreements over individual DSRs was the fact that the FEMA staffers (reservists) simply wanted to restore the damaged areas, while the county (and local) officials wanted to improve them. For example, county officials wanted to shore up a section of a hillside that had experienced a slide which dumped debris on a roadway, while federal officials were willing only to pay for clearing the debris off the roadway.

The restoration vs. betterment issue arises frequently because FEMA is constrained in what it can pay out for public assistance under its enabling legislation, administrative regulations, and policy decisions. Moreover, the issue was exacerbated in California by the unusual nature and great number of land and mudslides and the problematic issues of coverage under the NFIP.

Mitigation Measures

Prior to the disaster of 1982, the county administration had taken several mitigative steps:

1) In 1973, the county adopted a General Plan which placed a high value on environmental integrity, making it clear that development should not harm the environment. that plan contained an Environmental Hazards Element which pertained to new development.

2) Special mapping was done for hazard-prone areas, such as Inverness.

3) As a participant in the regular phase of the National Flood Insurance Program, the county had recently revised (as of 1981) the flood hazard areas.

4) The county had undertaken some slope stability and hydrology studies.

Shortly after the disaster, county officials began to think about the needs of the Inverness area, which had sustained extensive damage. The county committed $90,000 to an engineering firm to study the area's needs and to make recommendations regarding reconstruction in Inverness. (It could not be determined whther the county initiated this effort on its own or because it knew the Interagency Team had marked Inverness as a priority for attention.) The county planner expects that a special comprehensive plan will be needed for the Inverness community, which will probably require changes in land use regulations and building standards in the area. Examples of potential changes include prohibiting all new development in the upper reaches of the stream valley, and improving the floodproofing of existing buildings. It is expected that the proposed changes will generate considerable controversy in Inverness.

After the disaster, when the Interagency Hazard Mitigation Team was formed, the county and state representatives became part of the team from the very beginning. The county planning director was the local representative on that team. Two main sites for mitigation efforts were determined by the Interagency Hazard Mitigation Team: Corte Madera and Inverness. The former would require the completion of a structural solution, a flood-control system. The latter would entail mainly non-structural measures (e.g., land use, building code changes) and perhaps some structural measures (e.g., pumps, dredging). Further, the negotiations between the federal, state and county governments are continuing. The federal position had been to hold up the processing of claims and dollars for public assistance via the processing of payments for individual site Damage Survey Reports until Marin County demonstrated it was making "good faith" efforts to achieve the two priority mitigation projects just mentioned.

Interviewer's Perceptions

The burden of response and much of the recovery fell on the Public Works and Planning Departments, because of the large amounts of mud that slid and the attendant land use issues.

The widespread and numerous mudslides raised a number of questions, including definitional and coverage questions vis-a-vis the National Flood Insurance Program; the aggressive role of the federal Hazard Mitigation Team after a nonflood (i.e., mudslide or landslide) event; FEMA's insistence that the state's 406 plan be an active one, taking into account the multi-hazard risk facing the affected areas; and the position ofthe Reagan Administration regarding federal financial involvement in local recovery.

Marin County is an especially interesting example in that it has notable public capacity and capability as well as a nationwide reputation for the affluence of its residents. Yet, the conservative attitude of the local taxpayers regarding raising local taxes, together with the ceiling imposed by the state's Proposition 13, result in a questionable commitment to long-term mitigation measures on the part of the county and of the individual cities within its boundaries. Similarly, limitations of both personnel and resources seem to have restricted the state's ability to mitigate the landslide hazard, e.g., the efforts of the California Division of Mines and Geology.

On the positive side, the harmonious and carefully cultivated city-county relations that existed before the disaster worked well in the stressful postdisaster period. Similarly, the county quickly involved itself in the mitigation planning activities of the federally initiated Hazard Mitigation Team, which allowed it to both anticipate and participate in choices and decisions being made for the county.

Update on Marin County

Slightly more than two years after the presidentially declared disaster in California on January 7, 1982--for flooding, landslides, and mudslides--the research team went back to Marin County to review the progress the county had made in achieving its recovery and mitigation goals. In the first site visit report, two priority sites for mitigation measures during recovery were noted, the Corte Madera Creek project, and Inverness. At that time, the federal Interagency Hazard Mitigation Team (HMT), which provided a strong federal presence and involvement soon after the disaster, significantly influenced the selection of the priority sites.

At the time of the second visit, relatively little progress had been made in connection with the Corte Madera Creek project. The project is bound up in lengthy litigation which promises to extend into the indefinite future. Regarding Inverness, notable progress has been made, as will be described below. In addition, several individual communities within the county have decided to undertake and pay for some flood mitigative actions.

During the second visit, the research team observed a growing willingness to "pay for government" by a population that had only a few years ago supported Proposition 13. This new attitude toward local government was evident in Santa Cruz County as well. Local progress toward recovery and mitigation goals in San Rafael, Santa Venetia, Novato, Petaluma and also in Inverness suggests that the events of 1982 (and those of 1983 as well) led local officials to find the funding for projects citizens wanted. In some of these areas, local tax increases were necessary.

As required under the terms of the Presidential Disaster Declaration, and the attendant federal and state agency involvement,

several reports on mitigation were prepared during the recovery process. The first set was that of the federal Interagency Hazard Mitigation Team. The team issued reports 15, 30, and 90 days after the disaster was declared. The second source of mitigation reporting was the state of California, which prepared the State Hazard Mitigation Plan. This plan is supposed to be prepared six months after the state receives a Presidential Disaster Declaration; in actual fact, the state issued the State Hazard Mitigation Plan and One-Year Update almost two years after the disaster occurred. The reasons for and effects of that delay will be explained below. The net results, however, were that the HMT reports, which were prepared very early in the recovery planning period, had a significant influence on the planning process, while the State Plan was not issued early enough to influence the planning process. The State Report and its One-Year Update appears to be useful as a progress report and as an aid for long-term follow-up. It seems unlikely that the State Report influenced to any significant degree the recovery and mitigation efforts in the year following the flooding and slides. That is not to say that state officials may not have been influential during 1982.

The HMT report issued thirty days after the disaster (Febrary 7, 1982) identified two sites for priority attention: the Corte Madera Creek water control project and the Inverness area of the county. Subsequent federal activities (under the direction of the Hazard Mitigation Officer in the FEMA Regional Office) were mainly monitoring the implementation of the report's recommendations.

The state prepared its hazard mitigation plan under the provisions of Section 406 of the Federal Disaster Relief Act and Paragraph 8 of the Federal/State Disaster Assistance Agreement. The state's plan and its mitigation recommendations are intended to provide the framework for

flood hazard mitigation during the recovery process and to reduce the potential for future flood losses. The recommended measures were derived from the HMT Report of February 7th, 1982.

The state's Hazard Mitigation Plan also lists Corte Madera Creek and Inverness as the priority areas for hazard mitigation in Marin County. The report states that ". . . mudslide and landslide hazards are directly related to storm and flood conditions in this disaster and that these hazards can be reduced by an effective program of appropriate land use regulation, construction standards and emergency evacuation and warning plans."

For Marin County the state listed nine specific actions, each of which was described in terms of 1) hazard identification, 2) mitigation measure, 3) implementation, 4) funding, and 5) one-year update of the actions. One of the nine covered the Corte Madera flood control project; the other eight recommended actions dealt with needs in the Inverness area, including public facilities, public access, communications, and storm water flow.

The county has made significant efforts to implement the priority mitigation projects. The Corte Madera project, which requires local political decisions and the completion of litigation, will take several years to settle. Since the final decisions rest with the courts, the county cannot directly affect the timing or the outcome of the Corte Madera project.

In Inverness, which is an unincorporated area of the county, development has been in three steep and rugged canyons. Shortly after the disaster declaration, the county hired an engineering firm to prepare engineering designs for repairs to public structures and recommend policies for new construction to mitigate future damage in Inverness. The county accepted and acted on both of these products.

The county planner commented that improving the safety of existing structures is far more difficult and will take many years.

In response to the question, "What is the county doing differently since 1982?" the county administrator noted:

1) the continuing work of the Flood Control District (an entity that legally and financially is separate from the county government, although its Board of Directors is the County's Board of Supervisors);

2) a $4 million bond issue due on the ballot in November 1984, in the community of Novato for a structural flod control project;

3) increases in levies for flood-related projects in Marin County and several cities; and

4) spending of local money by San Rafael for its own flood control projects.

Other actions since 1982 that will improve local preparedness were initiated by the county's emergency coordinator. They include working with business and non-profit organizations to improve home and workplace preparedness, working with the local Red Cross to stimulate self-help efforts within neighborhoods, and crisis intervention programs for persons with disaster-related emotional and mental health problems.

As was noted after the first visit, Marin County exhibited quality public leadership during and after the 1982 disaster. The second visit reinforced the initial impression of unusually high competence both in general management and in emergency management at the county level.

Since the San Andreas fault runs through Marin County, the county has engaged in consistent and systematic earthquake emergency preparations and training since about 1970. For about 12 years, the annual emergency drills were just practice. A far-sighted emergency coordinator insisted that the periodic drills be run, despite the snickers of his colleagues. In 1982, when the county was hit by the landslides, mud flows and flooding, the county officials were ready and

able to deal effectively with this disaster--even though it was quite different from the one they thought would hit them. The dozen years of preparation during quiet times is highly unusual; but the ever-present threat of an earthquake caused the county to maintain a high state of readiness. When a different disaster struck, their preparations paid off.

County-State Relations

The state had provided National Guard personnel to assist Marin County during the response phase. The state also had provided some technical assistance in the forms of seismic mapping and geological resource analysis, and had participated in the Hazard Mitigation Team. In fact, two state officials participated in HMT activities, one from the Office of Emergency Services and the other from the Department of Natural Resources (Division of Flood Plain Management). The latter was instrumental in organizing on an informal basis a state-level interagency hazard mitigation team. Nevertheless, Marin County officials feel the state played only a minor role in the postdisaster period. These feelings of local officials regarding their state government have been documented in several of the earlier case studies, including communities in other states.

County officials have sent mitigation progress reports to state and federal officials for the past two years, with the knowledge that both levels of government are monitoring their efforts. County officials seem less concerned with strict enforcement of requirements connected with the '82 disaster declaration than they are with the prospect of not being eligible for disaster relief in a future disaster in the same area.

County-Federal Relations

County officials view the HMT as a positive and useful mechanism for focusing attention on mitigation and recovery needs soon after the disaster declaration. Public officials at all levels generally said that this process is useful, although local officials noted that usually it cannot provide the monetary resources needed.

County officials were very vocal about problems with the DSRs, with record keeping requirements, and with cash flow problems resulting from slow federal reimbursement of public assistance funds. In fact, at the time of the second interview, the Marin County Supervisor, who has emergency management overview responsibilities, was in Washington, DC, serving as spokesperson for the North Coast County Supervisors Association (a sub-state regional organization of elected county officials in Northern California) to discuss the above-mentioned problems with the director of FEMA. The list of his concerns is included in Attachment B.

Interviewers' Perceptions

The State Hazard Mitigation Plan was more a status report than a planning document, because it was issued almost two years after the actual event. (The delay was due to the number of disasters with which the over-worked staff had to contend.) Similarly, the press of new disasters prevents the FEMA Hazard Mitigation Officer from doing more than monitoring local ations about three to six months after a disaster declaration. Local officials are motivated to complete the recommended mitigation actions mainly because a significant amount of "unfinished business" might interfere with needed federal assistance in a similar, future disaster.

As noted earlier, the county administration is highly competent in normal times. What is unusual is the amount of time and attention paid to regular, routine meeting and training in emergency management. Prior to the 1982 Declaration, the county held regular emergency drills for more than a decade, even though no major disasters occurred. The fact that the San Andreas fault goes through the county does help to ensure the concern and attentiveness of the county officials. Nevertheless, the continuous attention to emergency management and the regularly maintained coordination and training activities allow the county to smoothly swing into action to handle an emergency.

Attachment A

Special Districts*

(Marin County)

Special districts are legal entities with an authorized governing body, operating in a defined area, with the right and duty to provide certain services. District fiscal powers include a variety of combinations of special assessments, property taxes, service charges, and the issuance of bonds. Most special districts are created by resolution of the Board of Supervisors and confirmed by the electors. The governing boards of districts may be elected or appointed, or the Board of Supervisors may serve in this capacity as set up by the enabling state legislation. In Marin County, as of January 1, 1980, 34 special districts are governed by the Board of Supervisors:

County Service Area	14	Permanent Road Division	5
Sewer Maintenance	4	Transit	1
Lighting	1	Parks and Open Space	1
Flood Control	8		

57 special districts are governed by local representation:

Community Services	7	Recreation	1
Fire	8	School	23
Marin Hospital	1	Soil Conservation	1
Mosquito Abatement	1	Sanitary and Sanitation	11
Public Utility	2	Water	2

Marin County is a part of 2 regional or multi-county special districts:

Bay Area Air Pollution Control
Golden Gate Bridge, Highway and Transportation

There are 5 regional agencies that exercise some control over Marin County:

California Regional Water Quality Control District, San Francisco Bay Region
San Francisco Bay Conservation and Development Commission (BCDC)
Metropolitan Transportation Commission (MTC)
North Central Coast Regional Commission
Association of Bay Area Governments (ABAG)

The size of a special district ranges from a few city blocks to a multi-county or regional district. A Local Agency Formation Commission (LAFC) reviews boundary changes for new and existing cities and districts within the county. The State Legislature is responsible for setting the boundaries and functions of regional or multi-county special districts and regional agencies.

A special district provides service that people feel they need which general government is not able to meet. It does not necessitate city incorporation where only a few services are required. Only the citizens within the special district pay for these services.

Special districts once formed, however, tend to be resistant to dissolution or change when the need for them lessens. Because of the great numbers and the overlapping of boundaries, there is sometimes little citizen awareness of or interest in special districts. One result is a lack of candidates for some district boards. Another disadvantage of many special districts is the lack of over-all planning for an area in budget priority, facility placement, and uniform, efficient service.

The taxpayer may determine which special districts he is paying for by referring to his tax bill. There are approximately 400 tax code areas in Marin County.

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* Source: "Your County Marin--A Citizen's Guide to County Government, 1980-1982," League of Women Voters, Marin County, California, April 1981.

Attachment B

The North Coast County Supervisors Assóciaton approved the following list of necessary improvements to PL-93-288 at its meeting of February 3, 1984. Supervisor Robert Roumiguiere of Marin County was authorized to present the list to FEMA during meetings the week of February 6, 1984.

I. Define as eligible extraordinary equipment maintenance as an eligible expense. Apply the preceding three year history of maintenance costs to determine such costs.

II. Employ the jurisdictions certified local schedule of equipment (owned) rates on old force account expenses.

III. Define directly related administrative expenses and fringe benefit expenses as eligible.

IV. Allow the use of State Controller required accounting format for storm project accounting and audits.

V. Allow full, directly related, engineering costs as eligible expense.

VI. Adopt FHWA standards for repair and reconstruction of storm damage sites. Allow construction to approved local standards including betterments required by current standards as an eligible expense.

VII. Improve reimbursement procedures to insure receipt of payments within thirty days of billing date.

VIII. Restore the reality of 100% federal funding for all disaster expenses. Stop all efforts to codify the financially disasterous and unlegislated 75/25 cost sharing formula.

IX. Stop excessive reviews of DSR's limit review process to the field review and a single administrative review.

X. Landslide policy is highly discriminatory to the State of California. If an engineering review determining a site to be re-buildable site restoration, expenses should be defined as eligible.

XI. Restore the disaster funding advance mechanism. Lack of cash flow is a serious impediment to disaster recovery. Initiate a presumptive advance mechanism based on a completed disaster assistance application and the FAST team estimates. Write down the presumptive advance against the maximum DSR based advance.

XII. Define secondary damage as eligible for disaster assistance. Secondary damage is defined as unavoidable damage incurred as a result of disaster response.

XIII. Apply Hazard Mitigation and Insurance requirements to sites with restoration costs in excess of $25,000.

CHAPTER XIII

SANTA CRUZ COUNTY, CALIFORNIA

Background

See discussion in the previous chapter.

Santa Cruz County

A few significant differences between Santa Cruz and Marin counties should be noted:

1) Santa Cruz County is in the Emergency Phase of the NFIP, although some cities within the county are in the Regular Phase. (More municipal actions to achieve flood plain management are required by FEMA of communities in the Regular Phase.)

2) City/county relations were not smooth prior to the disaster; and after the disaster, a Grand Jury found fault with the county's emergency response to the flood and mudslides.

A general description of the disaster was provided in the previous chapter. In Santa Cruz County, the torrential rains and subsequent mudslides caused destruction as well as about 22 deaths. It was a 100-year storm for much of the area.

Recovery Activities

Officials in Santa Cruz said the timing for the transition from response to recovery varied with the type of activity. The stream and high-water damage was repaired quickly, and within two weeks the Public Works Department was planning recovery actions. The road damage took a long time to complete, which meant that the beginning of the recovery period for that segment of reconstruction activities came later. In the early days of the disaster, virtually all county staffers assisted with operational jobs, regardless of their usual duties. For example, professional staff went to the severely stricken areas to assist with the manual labor needed to protect property and stem further destruction

(e.g., clearing away mud and debris from buildings and roadways). After a few days of basic, manual tasks, several switched to planning or analysis jobs, which they thought would make a more meaningful contribution to understanding and coping with the disaster recovery and mitigation.

Discerning the county government's priorities in the array of recovery issues and problems after the disaster was clouded by the priority site selected by the Interagency Hazard Mitigation Team. In Santa Cruz County, the team's report cited only one location, San Lorenzo Valley, although that is a large geographic area. County officials did not disagree with that site as a priority for attention, but they did think that some refinement and more specific target areas would be more appropriate in terms of the county's agenda for mitigation.

Since most of the damage occurred in residential and agricultural areas, the role of the business community and the extent of public/private interaction regarding recovery were minimal.

City/County Relations

Interaction between city and county officials in Santa Cruz County was troubled. The research team did not delve very deeply into the emergency response phase, since most of the issues regarding recovery from and mitigation of the land and mudslides arose later. Nevertheless, from the brief discussions of emergency preparedness and response, it became clear that there were problems. One problem was that the county was reluctant to activate the Emergency Operations Center (EOC) because it was vulnerable to flooding, potentially endangering the safety of the emergency serices personnel. A second problem was disagreement between city and county emergency personnel as to basic needs and priorities. Officials in some of the cities did not

think the county had been responsive to their needs during the response period.

Ultimately, a Grand Jury investigated and criticized the intergovernmental activities and relationships. The Grand Jury was characterized as "politically inspired" by some individuals. On the other hand, several persons commented that some county officials had over-reacted to the report. While the details of the Grand Jury process and results are not known to the field research team, the formation of the Grand Jury and the controversy over its actions reflect troubled relations between city and county officials. It appears that the city and county officials did not meet regularly prior to the disaster and that relations even under normal conditions were strained. As a result, the stresses of the disaster response and recovery exacerbated existing difficulties.

County-State-Federal Relations

There was considerable wrangling over the Damage Survey Reports (DSRs). Ultimately, the disagreements over what projects were eligible and what federal assistance would be made available resulted in the establishment of many scheduled meetings--weekly for two months after the disaster, and then biweekly--with the Congressman and top county, state, and federal officials in attendance. The county officials interviewed attributed need for such a series of meetings to their special neds for relief and assistance and also to the heavy demands they made on FEMA. Some local officials accused FEMA of not being familiar enough with the area, saying the agency should have relied more on local people--particularly with regard to the determination of the mitigation "opportunity" sites and the measures feasible to use.

Mitigation Measures

While the public assistance determination process became highly argumentative and politicized, the county-state-federal interchange about recommended hazard mitigation measures also caused a major stir. For reasons never explicitly identified, the county government did not name an individual to be the local hazard mitigation liaison for the Hazard Mitigation Team until late April, about 15 weeks after the Declaration was issued. This delay angered FEMA officials and raised questions about the county's commitment to hazard mitigation. As it turned out, county officials were, in fact, thinking about land use and other restrictions that would be necessary during the recovery period in the San Lorenzo Valley, even if they were not doing so in the context of the team effort. The local person assigned to the team in April was a member of the County Planning Department.

In the San Lorenzo Valley, a host of issues about land use controls, particularly in the Love Creek section of that valley had been simmering. The Hazard Mitigation Team report describes the terrain and hazard potential in San Lorenzo Valley as follows:

> The San Lorenzo Valley is an unincorporated part of Santa Cruz County and includes all of the San Lorenzo River Basin and its tributaries upstream of Henry Cowell Redwoods State Park (southern unit). The major tributaries are Zayante Creek, Love Creek, Bear Creek and Boulder Creek. the unincorporated towns of Felton, Ben Lomond, Brookdale, and Boulder Creek are all within the San Lorenzo Valley. The area is characterized by low density residential and commercial development surrounded by forest.
>
> Bearing the brunt of the storm, the hills of the San Lorenzo Valley received rainfall in amounts of 10" to 18" with numerous reports in excess of 24". The great weight of the rain in the soil exerted excessive stress on the slopes which triggered numerous landslides and mudslides. The slide situation was so delicate that rescue workers feared the propeller wash from helicopters and small planes would topple trees around them.
>
> The San Lorenzo Valley floodplain is very narrow, due to the deeply incised water courses, and broadens where

> tributaries feed into the San Lorenzo River. There is development in the floodplain 100-year flood level. The U.S. Army Corps of Engineers' preliminary flood frequency calculations show the San Lorenzo River at Big Trees at only a 10-year flood event.
>
> The San Lorenzo River Basin was the most heavily affected area in the declared counties. Almost every problem found in this disaster was evident in the San Lorenzo Valley. Landslide, mudslide and flooding caused loss of life and numerous injuries, loss of access and utilities, and damage and destruction of many buildings and facilities.
>
> An estimated 14 people were killed by landslide and mudslide in the San Lorenzo Valley. Reliable information on damages in San Lorenzo Valley is not available because the information is on a countywide basis. However, of the over 400 families from San Lorenzo Valley who registered at the Disaster Assistance Center, 39 reported their homes were destroyed, 152 reported major damage, and 217 reported minor damage.
>
> The Team is very concerned about the safety of developments in San Lorenzo Valley and concluded that the hazards, their severity and likelihood of occurrence must be determined before further development is allowed. Once the hazards are evaluated, new develoment and reconstruction should only be allowed if they can be reasonably safe from damage. Since most of the deaths in this disaster occurred in San Lorenzo Valley, the county should implement a warning and evacuation plan.

More specifically, the Hazard Mitigation Survey Team report listed the following work to be done: 1) identify significant hazards in San Lorenzo Valley; 2) evaluate the impacts of these hazards; 3) review and evaluate applicable land use regulations, construction standards and other existing hazard mitigation measures; 4) evaluate measures which could mitigate these impacts; and 5) recommend appropriate mitigation measures.

While county officials did not dispute the selection of San Lorenzo Valley for mitigation attention, they favored a narrower, site-specific focus. Further, some county officials were highly concerned with the potential cost and, of equal importance, the political feasibility of achieving mitigation--especially in the already developed portions of San Lorenzo Valley.

Interviewers' Perceptions

In Santa Cruz County, the bulk of the response work--e.g., debris removal, mudslides, creek cleaning--fell to the Public Works Department. That department, together with the Planning Department, also had the lead role in the recovery process. Yet, the county representative to the Hazard Mitigation Team was in the Planning Department. For reasons not fully known, the Planning Department appeared to have a secondary rather than primary role in recovery planning.

Fundamental to the conflict over the Hazard Mitigation Team's recommendations is the fact that the county's building codes and land use controls were not adequate to protect life and property from the disaster. The changes needed are a major community issue, one which sparks controversy because of the varying philosophies as well as ability and willingness to pay (directly and indirectly) for them. The outcome--and whether or not it was influenced by the Hazard Mitigation Team's efforts--will be a significant indicator of the future of recovery and mitigation in the county.

One of the criticisms of the county's emergency response was its unwillingness to activate the Emergency Operations Center because it was in the basement of the County Administration Building, which is susceptible to flooding. To ensure the safety of the emergency command personnel, the decision to activate was delayed. As a result, during the early hours after the emergency, centralized, effective leadrship at the county level was not as good as many of the city officials within the county wanted.

It did seem surprising that four months after the disaster, the county planning officials were not aware of federal Executive Order 11988 or its California counterpart. Both the federal and state flood

plain regulations require that attention be paid to flood hazard mitigation in every reconstruction project proposal to reduce the potential for future losses. Such requirements are the basis for the activities of the Interagency Hazard Mitigation Teams. A related limitation was the fact that the county did not name a representative for the Interagency Hazard Mitigation Team until late April, 1982. It is interesting to contrast the Santa Cruz situation with that of Marin County, where the County Planning Director was a participant on the Hazard Mitigation Team from its inception.

Update on Santa Cruz County

During the spring of 1982, Santa Cruz County had many problems to deal with after the devastating series of floods, landslides, and mudslides of January and February of that year. The problems ranged from inadequate emergency preparedness to a need for extensive changes in land use regulations for development in an area of delicate ecological balance. The local population concentrations are unusual in Santa Cruz County, which includes almost 190,000 persons. About 50,000 persons live in the canyon areas; about half of those live in unincorporated areas. The ability to mitigate natural hazards is limited because so much of the land within the county forms canyons, the population is scattered rather than concentrated, and many persons live in areas without strong local government.

Aside from susceptibility to flooding (both coastal and inland), the county has three major earthquake faults within its boundaries. A number of the persons who live deep in the canyon areas are reclusive--they live without electricity and municipal water and sewer services and they want minimal contact with public officials. For all these reasons,

it is difficult to identify all of those persons and structures at risk, let alone enlist their support for mitigation activities.

By the winter of 1983, when the research team was on-site the second time, the county had taken several major actions to reduce its vulnerability to future flood and landslide hazards. The county had thoroughly revamped its emergency management operation (including a substantial rewrite of its operations manual and the establishment of a second emergency oprations center); completed several of the land use control actions recommended by the HMT; and generally accomplished many changes that would improve the county's preparedness for a future disaster.

When county officials were asked what they were doing differently since the 1982 disaster declaration, they listed the following: 1) changes in county regulations regarding how to locate new construction and critical facilities; 2) several programs for the public to ensure better personal preparedness; 3) condemnation of 28 (intact) houses in the Love Creek area, most of which have been moved or torn down; and 4) condemnation of 200 structures in other parts of the county.

The State Hazard Mitigation Report

The 30-day HMT Report had selected the San Lorenzo Valley for priority attention. In the two years since the 1982 disaster, the county has implemented a number of mitigation measures in the San Lorenzo Valley and elsewhere. A brief summary of the 11 hazard items identified for mitigative action by the State Hazard Mitigation Report follows:

1) Map areas with slope instability,

2) Review population directly in geologically hazardous areas,

3) Improve maintenance for public and private roads,

4) Reduce damage due to stream bank erosion and stream side slope failure,

5) Accelerate log and debris jam removal,

6) Improve flood plain mapping,

7) Improve storm drain capacity,

8) Design standards for floodproofing and elevation of structures in the flood plain,

9) Improve policies in the County General Plan relative to project design and densities in flood plains,

10) Require the elevation of mobile homes in flood plains above the base flood level after they have sustained damage in excess of their value, and

11) Revise ordinances regarding elevation of septic systems in the flood plains.

Of the above list, seven items had been at least partially completed as of January, 1984; work on items 7, 8, 9, and 10 has not yet been completed. Some of these latter items are years from completion, depending on availability of funds.

In addition to the major mitigative actions recommended by the HMT, county officials in Santa Cruz have undertaken a variety of other measures to facilitate the county's recovery and improve its future preparedness. Many taxpayers have changed their attitude about government spending. Since the 1982 and 1983 floods and related devastation in Santa Cruz, citizens are more willing to pay for flood and slide prevention measures and better understand the need for certain land use regulations.

County land use regulations now require a geologic hazards analysis on sites for dvelopment. County officials make field visits and personally review all sites of new construction. It should be noted that four county employees perform these site inspections and also do erosion control work.

The county has mounted a public information campaign to provide citizens with more information about hazards and preparedness. In the fall of 1983, the county prepared a tabloid with information on natural hazards which was mailed to county residents. Also, county officials organized a series of community meetings at which county geologists spoke with citizens about the geologic hazards from which they are at risk. In addition, the county has stepped up its erosion control work.

Other mitigative steps include setting up about 100 private road assessment districts as a new mechanism for coordinating private response, establishing a watershed review process for the Soquel Creek area, and improving a flood alert system.

County-State Relations

County officials acknowledged help from the state after both the 1982 and 1983 disaster declarations. Yet they view the state as a "mild" advocate of their needs and interests vis-a-vis the federal government and would like stronger support from the state. "The state should defend its children," explained one county official. In addition, local officials think that the state offers too few disaster recovery programs.

County-Federal Relations

As noted earlier, initial county-federal relations were filled with tension and conflict. County officials acknowledge that they were very aggressive and argumentative regarding public assistance from FEMA. They defend their outspoken behavior, saying that for a relatively small county government the paperwork is extremely burdensome, the amount of federal aid and assistance is too little and hence "devastating" to a small community, and the administrative process for achieving and implementing the DSRs is "overwhelming." At the time of the second visit, county officials were less agitated about the process, but they

were still very vocal about the problems. Cash flow is a continuing concern for the county due to slow payments by the federal agencies.

The public works officials, on whom most DSR-related work falls, commented on the grey areas in the process. Some public assistance projects which the county puts forward to FEMA for payment eligibility determination are answered with a "probably no," rather than a "yes" or "no." When the possibility for project-funding was thought to exist, county officials would pursue it. In Santa Cruz, county officials felt that they "had chased the carrot too far" on occasion. In addition, the Public Works Department spent about $250,000 on engineering consultations which were necessary to supplement the existing staff to meet the workload. These expenditures of both time and money are the types of efforts that contribute to the feeling that the administrative burden is overwhelming. FEMA is viewed as not offering enough financial assistance to make recovery possible, yet placing heavy demands on local officials after a disaster.

Santa Cruz County public works officials advise others in their situation to document everything. They recommend recording project details from the engineering perspective (including photos) and documenting how time and money are spent. The details help later with presentations and the inevitable appeals. They also help if a subsequent disaster wipes out the earlier project for which a DSR was prepared.

They also recommend being as specific as possible in requests to federal officials for equipment and expertise. It's also important to know how to ask for things--for example, you may be better off calling for a training exercise rather than for disaster response assistance if you are asking the state for help from the National Guard.

Interviewers' Perceptions

The second visit to Santa Cruz was especially useful, because some mitigation measures--like changes in land use requirements and building standards--require many months or even years to implement. The second visit provided an opportunity to document changes that had mitigative effects, but were not evident at the time of the first field trip.

Since the first visit was about four months after the declared disaster event (and additional land and mudslides occurred after that date), it was not yet possible to discern what mitigative steps would be taken during the recovery period. This follow-up more than a year later was useful because it: 1) reinforced the decision the research team made in Year II of the project that a first visit should be made about one year after the declaration; and 2) validated the decision to revisit communities where recovery was expected to be long and difficult, but where potentially significant hazard mitigation measures might be implemented.

CHAPTER XIV

FORT WAYNE, INDIANA

Background

The city of Fort Wayne is the second largest city in Indiana, with a population of approximately 172,000. The city is located at the confluence of three rivers: the St. Marys, the St. Joseph, and the Maumee. The St. Marys flows into the city from the south, and the St. Joseph flows into the city from the north. These two rivers meet in the downtown section of the city, forming the Maumee River, which flows in an easterly direction out of the city. The St. Marys and the St. Joseph drain two entirely different watersheds and, therefore, their flows are independent of each other.

Owing to an extensive network of dikes and levees, the city can usually withstand the floodwaters of either the St. Marys or the St. Joseph rivers. Because each river is in a different watershed, each river peaks at different times, allowing the Maumee to carry the water out of the city. When temperatures and precipitation combine to deliver peak flows to both rivers simultaneously, the Maumee cannot handle the load. The resulting floods often reach disastrous proportions.

The city of Fort Wayne has a long history of floods. Between 1829 and the winter of 1982, the city had 24 damaging floods. The most damaging flood in the city's history was in 1913, when the Maumee River crested at 26.1 feet. Floods in 1959 and 1978 resulted in Presidential Disaster Declarations. It is interesting to note that while the 1913 flood of record produced a peak flow of 34,000 cubic feet per second (cfs), causing the Maumee to crest at 26.1 feet, the flood of 1982 produced a peak flow of 27,000 cfs, causing the Maumee to crest at 25.9 feet. The city has a major flood on the average of once every six

years, but city officials think there are floods at more frequent intervals.

Description of Disaster

The flooding disaster of 1982 began on Friday, March 12, when the rivers started to rise; it did not end until Sunday, March 21, when the last of 9,000 evacuees returned to their homes. The flood waters of March can be traced in part to a record snowfall in Fort Wayne during the winter months; the snowfall exceeded 70 inches and caused several snow emergencies. The snow, combined with unseasonably warm temperatures in the watersheds of both the St. Marys and the St. Joseph rivers, set the stage for what has since become known in Fort Wayne as the "Great Flood of '82."

Extent of Damage

The Great Flood of '82 was the second most damaging and the most costly flood in Fort Wayne's history. Nearly 20% of the city was flooded, causing damages of almost $50 million. Flood-related costs include the cost of emergency operations, damage in the primary impact area, and damage in the secondary impact area. The cost of emergency operations for flood fighting totalled more than $4.7 million.

The total cost for all public and private flood damage, as well as related expenses, was estimated at over $45 million. Public property damage, which includes public and city utilities in the primary impact area, totalled over $7 million. The cost of flood-related damage outside the flooded area was almost $2 million. In addition to these high costs, 9,000 persons had to be evacuated from their homes during the course of the emergency. About 35,000 people voluntarily participated in the flood fighting activities as "sandbaggers" and support personnel.

As great as the costs and impacts were for the city and its residents, the disaster could have been much worse. If two strategic dikes had failed, thousands more people would have to have been evacuated and the cost of flood damage would have been an additional $27 million. The city was almost divided into six "islands," and it came close to losing its water supply. City officials and citizens realize that flooding is likely in the future.

Because Fort Wayne was in the midst of a severe economic downturn, the 1982 flood and its attendant expenses increased the city's financial and personnel difficulties. Bond revenues will have to be used to pay the local share of some federal disaster recovery grants, as well as for several million dollars in street repairs. In addition, a number of capital improvements will be delayed (or cancelled) in order to give precedence to mitigation activities. A sizable number of layoffs have occurred and more are expected.

In contrast to negative financial consequences to the city and its residents, there were some positive aspects to the flood. After an extremely hard winter with record snowfalls, the city's fight against the flood of '82 appears to have raised the community's spirits. The flood also diverted the community's attention from its serious economic situation, reflected in an 11.4% unemployment rate and possible plant closings. The flood of '82 also brought the city of Fort Wayne national media exposure, including many pictures of President Reagan (wearing hip boots) assisting with the sandbagging efforts. The city capitalized on this publicity by running an advertising campaign to attract new businesses. The theme of the campaign was "Fort Wayne, the City that Saved Itself."

Response Phase

During the winter before the flood, the city had several snow emergencies during which the city's Emergency Operations Center (EOC) was activated. These snow emergencies were cited as good practice for the flood which followed. Also, since everyone expected a spring flood, the city formulated a plan in advance. The Fort Wayne Flood Preparedness Plan, dated February 22,1982, is comprehensive and practical. The plan describes the staffing of the EOC (which is next to the mayor's office) and sets forth the responsibilities of each city department during a flood emergency. In the early stages of the flood the plan worked well; nowever, the disaster soon outgrew the plan and on-the-spot group decisions had to be made.

For example, on Tuesday, March 16, sandbagging operations were switched from the city garage to the memorial coliseum. The plan did not envision the need for the 30,000 to 35,000 volunteers that eventually responded to fill and place sandbags. At the height of the flood, local officials feared that the city would be divided into six "islands" by the rising waters. Public safety officials responded to the threat by quickly developing contingency plans to reposition fire and police resources to operate in six locations.

Some of the problems with early response to the flooding were the result of the swift onset and the timing of the flood. The flooding began on Saturday, March 13, 1982, the first nice day of spring, while many people were away from their homes. This made it difficult to contact both city employees and volunteers. The good weather also made it hard for many people to believe that there was a flooding problem.

The U.S. Army Corps of Engineers arrived Saturday with additional sandbags and pumps. Cooperation between the local government and the Corps was characterized as good, but city officials seem to feel that

the Corps was operating under tight legal constraints as to what it could and could not do.

The city's response to the flood reflected its leadership's normal management style, which is characterized by very tight control at the policy level and great discretion at the operational level. Policy issues were decided by the mayor, with advice from a small number of advisors. Tasks were identified by the policy group and department heads, and then assigned to personnel working in interdepartmental teams. For example, when the command staff of the police department identified one of the first problems caused by the flood--traffic congestion and street flooding--they assigned the head of the traffic division to the EOC to direct road closings and the rerouting of traffic.

On Sunday, March 14, the governor declared the city and surrounding Allen County a disaster area. The National Guard responded and assumed responsibility for security in the evauated areas. The National Guard worked exclusively with the State Police, allowing the city police to concentrate on traffic problems caused by the flood and to maintain service areas of the city (80%) which were not affected. Local police officers were placed on 12-hour shifts.

All the resources of the city were brought into the extended flood fight. The city has approximately 1,800 employees, and when city personnel ran short, contractors were used. The city school system provided transportation for the thousands of volunteers who worked on the dikes. The city's response activities can best be characterized by the mayor's advice to other local officials faced with a similar disaster: "Be flexible; call all agencies **fast**; don't be afraid to spend money." The mayor followed his own advice, and the city survived, but the cost was high. Because of the flood, the severe winter storms,

and the depressed local economy, it was necessary to: 1) issue a $1.5 million bond in order to raise the 25% match for the public assistance component of the Presidential Disaster Declaration; 2) issue a $3 million bond to finance street repair; and 3) lay off 70 city utility employees. In addition, the entire capital improvement budget is being reconsidered. All of this took place in a state which has had property tax freeze legislation since 1973, and in a city which is making concessions to keep its major industrial employer while at the same time trying to attract new industry.

Recovery Activities

Recovery activities began before the response phase had ended. In the early part of the response phase, a consultant with disaster experience who was working for the city on an unrelated project advised city officials of some of the recovery and mitigation problems he knew they would face. This convinced the officials that one person should be given lead responsibility for the recovery phase. Since the city did not have anyone on staff with recovery experience, an outside consultant was hired. Four days after President Reagan visited Fort Wayne, the state received a Presidential Disaster Declaration for Allen County. That same day, March 20, the city's recovery consultant arrived.

On March 23, 1982, the mayor's office distributed an internal memo describing a four-phase flood recovery effort. Each phase was assigned to an interdepartmental team. Phase I involved a critique of the city's response to the disaster; Phase II, headed by the recovery consultant, was to deal with public recovery issues, such as the Diaster Survey Reports (DSRs), and relief issues; Phase III was a 30-day effort to produce a local mitigation plan; and Phase IV consisted of a "Flood Festival" to thank the many flood volunteers for their assistance.

The city administration took a very active role in the Disaster Assistance Centers (DACs). Seventy city employees were detailed to work at the DACs. Two identical centers wre set up in the same building to reduce waiting time. Interviews with victims at the DACs often included the participation of local mental health workers.

In addition to participating in the DACs, the city set up a non-profit foundation to distribute the flood relief money which had been contributed by many individuals and organizations. The city was able to anticipate the need for this foundation through information provided by its Citizens' Advocate Office.

During emergencies, the Citizens' Advocate Office and the Office of Civil Defense share the responsibility for managing the EOC. The Citizens' Advocate Office also responds to non-emergency requests for assistance.

Fort Wayne Flood '82, Inc. was created on March 21, 1982 as a non-profit foundation to receive monetary and material donations for flood victims. The fund was managed by a board of directors representing the community. Flood victims could apply for grants of up to $250 by completing a simple application form. Grant applicants had to meet three requirements: 1) live in a flooded area of Fort Wayne or Allen county; 2) either own and live in their own home in the flooded area or rent a house, apartment, or trailer (absentee landlords were not elibible); and 3) apply for $250 or less. As of June 4, 1982, Fort Wayne Flood '82, Inc. had received approximately $300,000 and had distributed $235,617 directly to individuals. Eighty-three percent of all applicants received grants. About 1,240 awards were made to individuals, with the average grant amounting to $190. The remaining funds will be distributed to non-profit organizations that spent money in the flood fighting effort or lost equipment as a result of the flood.

Mitigation Measures

Local mitigation planning was initiated as Phase III of the four phase recovery process described earlier. The Flood Protection Planning Team was mainly an in-house team composed of 12 members from key departments representing a variety of professional perspectives and skills. The team's planning process also involved state and federal officials, Allen County engineers, and private consultants under contract to the city. The Indiana Department of Natural Resources provided computer analysis of solution elements, and the U.S. Army Corps of Engineers aided in the development of the alternative solutions summarized below. Overall, the team was charged with identifying land use development and flood prevention alternatives and selecting a specific strategy to prevent recurrence.

A parallel but more restricted task was undertaken by the Interagency Hazard Mitigation Team (HMT). Members of these teams were appointed by the regional FEMA Director following the disaster declaration. The HMT is composed of federal agency representatives and representatives of state and local governments. Several members of the Fort Wayne Phase III Team also were members of the HMT. While the activities of the two teams were similar, their perspectives and goals were different. Beginning with the initial joint meetings, efforts were made to integrate both sets of recommendations in order to produce consistent, sequenced mitigation and flood protection options. Drafts of the HMT report were evaluated by the representatives on that team from the State of Indiana and the City of Fort Wayne to insure consistency with the flood protection plan subsequently produced by the Fort Wayne Phase III Team. That team maintained coordination with the federal agency members of the HMT.

The Flood Protection Planning Team

For the Phase III Team, the complexity of the mitigation planning task and the 30-day completion schedule established by the mayor required an intense team effort and a major reallocation of duties for all team members. Much of the early work was directed at developing an accurate data base for use in preparing the mitigation and flood protection alternatives. A detailed field study provided data on flooded and potentially flooded areas. The team emphasized the development of flood protection alternative solutions for the potential impact of the 1982 flood, thereby broadening its frame of reference and demonstrating commitment to long-term solutions to the flooding problem. A variety of technical, economic, environmental and other criteria were used by the team both in developing and selecting alternative solutions. As will be explained, these solutions were in part based on the Hazard Mitigation Team Report.

The Hazard Mitigation Team Report

The HMT focused on the problems and opportunities of specific neighborhoods in providing a framework for flood hazard mitigation during the reconstruction phase. This strategy was chosen in order to 1) utilize the Mitigation Team's recommendations, 2) avoid duplication of efforts vis-a-vis the Phase II Team, and 3) help bridge the gap between whatever long-term alternatives were developed and the shorter-term flood protection needs in Fort Wayne.

The HMT developed its recommendations and presented them in the form of three distinct strategies, based on working assumptions about the flood potential in three different areas. The three strategies are as follows:

1) Offer 100-year protection without the need for flood fighting. Elements in this package emphasized short-term structural measures and focused on the Pemberton

area, which was the focal point of the massive sandbagging effort described earlier.

2) Offer 100-year protection with flood fighting. In some damaged areas, the team chose a combination of nonstructural, short-term mitigation measures, including floodproofing, limited acquisition and relocation, technical assistance and training, and purchase of flood insurance. Limited structural measures were also included.

3) Reduce the effect of flooding in those neighborhoods where 100-year protection is not possible in the near future. These elements emphasized floodproofing by homeowners, the purchase of the flooded Michael-Ross area, and review of potential relocation of several businesses out of the vulnerable central business district area known as the Thumb.

As shown on the following summary of the HMT's recommendations from the April 5, 1982, report many of the mitigation measures are short-term, nonstructural, and expensive.

The HMT employed both economic and technical criteria in developing the proposed measures; it recognized the need to be realistic because of the long history of development in the flood plain as well as the estimated high cost of extensive structural and nonstructural solutions (e.g., large-scale relation). One major nonstructural measure was endorsed. This endorsement was contingent upon the development of a comprehensive, long-term flood protection program by the city of Fort Wayne.

The Fort Wayne-Allen County Flood Protection Plan

In its planning process, the Phase III Team intended to develop a full range of alternative flood protection solutions. It was recognizd that a number of the solutions would be considered infeasible or unacceptable. The alternatives that were developed ranged from wholly nonstructural to those emphasizing long-term major structural mitigation measures. The nine alternatives that ultimately were identified by the team included diversion, evacuation of the flood plain, floodproofing,

channelization, diking, and impoundment. The team thought that it was essential to develop solutions that would offer protection in the longer term, as well as for the interim period. In addition, the proposed solution had to be financially realistic and acceptable to the community.

Two sets of criteria were employed in developing and selecting alternative solutions. The technical criteria consisted of engineering standards, regulations, and guidelines, based in part on current plans and studies. A second, broader set of criteria was employed to evaluate the various alternatives and to propose a single solution. These criteria include:

- technical feasibility
- monetary cost
- effectiveness and reliability in reducing flood damage
- energy and resource use
- public acceptance
- implementation capability
- impact on the natural environment
- social and economic impact

The development of the nine strongest alternative solutions involved extensive discussions among local engineers, planners and other team members. The team then conducted public hearings on the proposed solutions and subsequently used citizen comments to help refine the alternatives and to reduce the number to be further considered.

After the first public hearing, the team refined some of the solutions and removed others from further consideration. Each of the solutions seriously considered contained some element of a diversion approach to mitigating future floods, i.e., a viable comprehensive solution must include the diversion of some portion of the St. Marys River 100-year floodwaters around key parts of the city of Fort Wayne.

A refined version of Alternative 4 was selected as the best comprehensive flood protection solution, because its multi-faceted

approach incorporated the short-term mitigation measures recommended by the Hazard Mitigation Team, a variety of the stronger concepts and features of other alternatives (acquisition-relocation, dike and levee improvements, internal drainage improvements),and the most acceptable of the key long-term measures (40% diversion of the St. Marys 100-year floodwaters).

Alternative 4 Implementation Issues

The proposed implementation strategy for the proposed flood protection solution is considered by Fort Wayne officials to be both optimistic and realistic. An initial trip to Washington, DC by a delegation from Fort Wayne, the other local jurisdictions affected by the 1982 flood, and the state of Indiana set the tone for subsequent implementation efforts. The first trip, early in April 1982, was made prior to the completion of the flood protection plan and the adoption of Alternative 4. Its purpose was to discuss damages and to explore potential mitigation and long-term recovery options that could be supported in Washington both by members of Congress and key federal agency officials. The trip was successful because it publicized the magnitude of Fort Wayne's disaster and the need for mitigation and recovery assistance.

After the flood protection plan was completed (and Alternative 4 was selected), another delegation traveled to Washington to present the plan and to demonstrate local initiative in developing viable mitigation solutions. The plan had been endorsed and accepted by the various local governments and key state officials, along with a number of regional federal agency officials. On August 26, 1982, FEMA approved two mitigation projects for 75/25% funding in Fort Wayne. One project will protect the Fort Wayne wastewater treatment plant from flooding through the construction of floodwalls and an earthen berm. The second project

will prevent flooding in two buildings on the Purdue University, Fort Wayne Campus. Gate valves will be installed in the storm and sanitary sewer lines outside of the buildings. Closing of these valves during flooding incidents will prevent damage to mechanical equipment located in the basement of the libary and student union buildings.

In agreeing to this innovative action, the Associate Director used the following standard:

> Public facilities in the 100-year floodplain damaged by a major disaster shall be protected against anticipated flooding damage by flood hazard mitigation measures, but only where the proposed measures meet the following four conditions:
>
> 1. The measures must be judged effective in substantially alleviating or eliminating recurrence of flooding damage done to the public facility by the major disaster.
>
> 2. The measures must be feasible from the standpoint of sound engineering and construction practices.
>
> 3. The measures must be cost-effective; further, they must be more cost-effective than any alternative measures which would be eligible as disaster-proofing. In any event, the cost of the measures shall not exceed a small percentage of the eligible project (DSR) costs approved by FEMA unless approved by the Associate Director under unusual circumstances on a case-by-case basis.
>
> 4. The measures must be consistent with applicable NFIP standards (44 CFR, page 59, LT seq.), Floodplain Management Regulations (44 CFR, Par 9), and (where applicable) environmental considerations (44 CFR, Part 10).

Proposed projects will be reviewed on a case-by-case basis by the Associate Director of FEMA's State and Local Programs and Support, for compliance with the above conditions.

Fort Wayne officials have initiated the 18-month implementation plan, which includes 12 key tasks for accomplishing flood protection under Alternative 4. These tasks include:

- upgrading flood-fighting capability
- obtaining plan approval and adoption

- establishing a new organization to control flooding
- creating an interim organization
- conducting preliminary design work (revised cost/technical estimates)
- improving levees to original condition
- installing backwater gates (to prevent sewer system damage)
- repairing sewers and pumping stations
- performing river dredging
- performing ditch cleaning
- acquiring land
- planning the Trier Ditch cut-off (the 40% diversion)
- raising existing dikes
- limited construction of new dikes

Several of the steps in the implementation plan were assessed by Fort Wayne officials as being relatively straightforward and non-problematic. Other steps, however, could pose major stumbling-blocks to the effort. The officials stressedthe integrated nature of the plan, and that all elements are necessary to achieve the level and immediacy of flood protection required to insure the safety of Fort Wayne and the affected areas nearby. Perhaps the most serious problem is in bringing certain dikes and levees to original pre-flood conditions, employing bentonite trenches in especially vulnerable locations. This action had been recommended by the Detroit office of the U.S. Army Corps of Engineers following an extensive survey of the area. Even though the establishment of stable dikes is critical to the integrated flood protection plan, a difference in interpretation over the permissibility of the recommended bentonite treatment between the Detroit COE district office and the Chicago COE regional office had not been resolved at the time of this writing.

A number of other implementation steps could prove difficult, including obtaining plan approval by the public and adoption by the City Council, and establishing a new organization--possibly a conservancy type special district--to administer the flood protection effort. Despite possible difficulties, the city of Fort Wayne already has assigned a variety of implementation responsibilities to local departments.

To complement these internal efforts and to assist in the resource procurement and marketing of its ambitious flood protection program, the city not only has shifted its internal staff resources, but has retained the services of the recovery consultant mentioned earlier and the consulting engineer who was instrumental in the earlier response and recovery phases. These actions are consistent with the basic operating policy of Fort Wayne.

Interviewers' Perceptions

Fort Wayne developed an ambitious and aggressive plan of action to mitigate the effects of any future flooding and to help its citizens recover from the Great Flood of '82. Given its history of flooding, however, it is surprising that so few of the elements of the current flood protection plan have been implemented. One reason for this failure to adopt long-term mitigative measures in the past was identified by the Phase III Team as "complacency."

After the 1978 flood, as was true after earlier floods, no real effort was made to find an overall long-term solution to the flooding problem. Instead, existing protective structures were restored to their previous condition. A variety of attitudinal, political, and management factors seem to account for the apparent change in direction following the 1982 flood. The administration in the city was highly sensitive to

the political and other ramifications of its actions. Given the administration's philosophy and the past failures to effectively mitigate floods, in 1982 the local public leaders emerged with an unusual, perhaps unique, approach to all phases of disaster management. All phases of emergency management were directed and coordinated by a top level policy group. Independent actions by line agencies were discouraged. Also, existing local government priorities were modified to permit major shifts in duties for key personnel for significant periods of time. Where the needed expertise was not available in-house, experienced consultants were hired, notably for the longer-term recovery efforts.

Fort Wayne's usual management approach emphasizes teams, flexibility, and problem-solving. The same approach characterized Fort Wayne's efforts throughout the 1982 flood emergency. Some of the flood response and recovery results to date appear significantly different from those often found in similar disaster settings, primarily due to the management approach of the local public leaders. Although inconclusive at the time of writing, these results may be instructive to other communities. They are summarized as follows:

1) The flexible team approach enhanced effective policy direction and strengthened decision making in all emergency phases.

2) This management approach is politically acceptable, and it is perceived locally to be effective, because it permits the citizens to see clearly that the government is using its own resources to the fullest extent in their behalf.

3) The approach is results-oriented. The teams for each phase developed measurable goals and target dates for accomplishing them. At least one team was involved in a critique of the respnse phase in an effort to improve future emergency operations.

   Use of the team approach for Phase III accelerated the mitigation effort--the city decreased the length of time

needed to establish mitigation goals and initiate efforts to obtain outside funding.

Also, the approach allowed the local administration to capitalize on the community and political impacts created by the response efforts, particularly by the successful attempt to demonstrate local initiative.

4) The management approach used by Fort Wayne may increase the likelihood of effective change and community betterment. By activating separate teams with overlapping schedules, the administration effectively reduced the time between response, mitigation, and recovery efforts, thereby preventing the "vacuum" that often occurs in postdisaster settings.

The momentum produced by Fort Wayne's innovative approach may improve its mitigation and recovery chances. However, if the implementation of mitigation plans is limited by lack of financial resources, the recovery process may be less comprehensive and take longer than planned. Despite the difficulties facing Fort Wayne, there appears to be a steadfast commitment to implementation of the proposed flood protection plan. The mayor and other local officials obviously have shown strong initiative.

Update on the Recovery of Fort Wayne, Indiana

About 18 months after the flood, and almost one year after the initial site visit, the project staff returned to Fort Wayne for a second look at the city's progress. The project team wanted to see how the implementation of Ft. Wayne's unusually ambitious mitigation program had proceeded.

The 18-month milestone turned out to be especially appropriate for two reasons: 1) 18 months is the usual period FEMA allows for the completion of approved projects for public facilities repair and restoration; and 2) 18 months was the remaining time in the mayor's term of office, hence the period for which he could make commitments. Mayor Winfield Moses was re-elected in November, 1983. Consequently, it is

expected that the city's flood protection and mitigation implementation efforts will continue as planned.

Recovery Activities

About two months into the recovery period, the special assistant to the mayor and the consultant assigned to the recovery planning effort gradually phased out of recovery activities and into other projects. the City Controller--who serves not only as financial manager, but also as emergency management coordinator--gradually reduced his involvement in disaster-related activities as the months went by.

Yet, at the 18-month point, the city's planning director and public works director still were significantly involved in flood recovery activities. Both said their workload had not yet returned to pre-flood status.

In the aftermath of the disaster, the local public officials quickly determined their priorities for reconstruction, recovery, and mitigation and then made plans to implement them. In the short-term, the city had a Flood Protection Plan and also an 18-month Work Plan for flood recovery projects. A copy of the major projects in that plan, with notations about completion by the time of the second visit, is appended as Attachment A. The city had made substantial progress in completing the scheduled projects by the time of the second visit.

For the longer-term, the city outlined its Flood Hazard Mitigation Plan for the years 1984-88. (The "White Paper #3B," issued by the mayor in September, 1983, is briefly outlined in Attachment B.) One of the proposed items in the city's Flood Hazard Mitigation Plan is the formation of a Conservancy District (CD), according to the procedures required under Indiana state law. The CD is a special taxing district whose responsibilities include flood protection for Fort Wayne and surrounding areas. Since the watershed areas cover almost the entire

county, the city's boundaries are too narrow for the flood protection measures needed in the long run. The CD also would allow for the maintenance of dikes, other structures, and green space in perpetuity. It could do so via its taxing power (e.g., $ .20 per $100 of assessed value), escrow tax, and sale of bonds.

The CD also makes sense from a political standpoint. In an area where one political party tends to dominate politics in the city and another one in the county, the CD would provide a de-politicized environment where technical expertise and continuity would be likely. The advantages of using a CD for long-term flood protection are that the organization would have an exclusive mandate, cross-jurisdictional powers, and its own budget. With its own taxing and bonding authority, it should be self-sustaining. There are nearly 70 such districts in the state, but the use of one for a long-term solution to flood protection may be unique.

Financial

The controller is not only the city's financial manager, but in effect serves as city manager on occasion. In case of a city-wide emergency, he/she serves as the Emergency Management Coordinator. The controller and his department were used to functioning in non-traditional ways, which provided the flexibility and experience required to handle the flood response and recovery. According to the controller, his two major concerns immediately after the flood were to ensure that needed supplies and materials were made available, and proper record keeping and other details of expenditures were documented, so that outside government assistance and grants would not be complicated or jeopardized. As the recovery continued, he added a third concern: the authorization and documentation of overtime labor.

Given the depressed economic conditions prior to the 1982 flood, the research team was especially interested in how those conditions would affect the recovery. According to the local public officials interviewed at the 18-month mark, neither the local government's financial condition nor the private sector were irreparably harmed by the flood. (An economic analysis was not part of this case study.)

At the time of the second visit, the controller explained that among the financial assets available locally was a special local fund called the Endowment Trust Fund. The Endowment Trust Fund had not been specifically mentioned during the research team's first visit to Ft. Wayne. This fund, which derives its monies from leased city utilities, brings in $1.5 million of revenue annually. About $ .75 million is unencumbered each year. At the time of the flood, there was $3-4 million in that fund; consequently, the controller was able to use those monies for response and recovery costs. Also, at the time of the flood, the city was about to issue water and sewer bonds; as a result of the flood, the city increased the total amount of the bond issue by about 10% to bring in additional monies for water and sewer repairs.

DSRs/Record Keeping/Audit

As has been true elsewhere, when key personnel have had previous experience with a federally declared disaster, they can anticipate the documentation and record keeping needed for public assistance from FEMA. In this case, both the city engineer and the controller were experienced and saw to it that the records for the DSRs were correct and in order for the federal auditors.

One city staff member, borrowed from the Economic Development Department, was given the full-time job of implementing the projects authorized in the 18-month period following the federal approval of public facilities repair and restoration. According to the city

officials, this care with record keeping and with tracking the progress of repair projects helped them to convince the FEMA officials to do an early auditand hence allow the flow of federal dollars to the city to proceed ahead of the usual public assistance reimbursement process.

Under this special arrangement, FEMA performed a partial payment audit--the audit was done at the time the public facilities repairs were about 90% completed (although the paperwork was not yet completed). FEMA auditors came in to do the audit and waived the usual prior state audit. FEMA agreed to reimburse the city for 75% of its share of the project, upon completion of the partial audit. The reason cited for this special audit was that despite city officials' efforts to deal with both flood recovery and flood protections, the city was having serious cash flow problems.

Interviewers' Observations

Fort Wayne had an unusually positive relationship with the federal government and with FEMA in particular. The city officials were especially pleased with the efforts of two FEMA staffers--one who was on the Hazard Mitigation Team and the other who was the head of Disaster Assistance in the Chicago Regional Office--because of their wilingness to stretch to meet the needs of the flood-stricken community. For its part, the community had to adjust its attitude toward the Army Corps of Engineers, an agency which it had asked not to come into the area again after a major disagreement during the last major flood.

The city's continuing commitment to long-term flood mitigation efforts and to the formation of a special district that could attend to such needs in perpetuity are commendable.

Attachment A

FORT WAYNE-ALLEN COUNTY FLOOD PLAN

18 MONTH WORK PROGRAM

		COST ESTIMATE	POTENTIAL FUNDING SOURCE
I.	**FLOOD FIGHTING**		
*A.	River Gages	$ 15,000	U.S. Geological Survey Dept. of Natural Resources City
*B.	Flood Emergency Action Plan	N/A	
C.	Early Warning System	$ 90,000	State of Indiana
*D.	Floodproofing Program	$ 10,000	Community Development Block Grant
		$ 5,000	FEMA
II.	**DIKES**		
*A.	Minor Repairs		
1.	Bella Vista	$ 15,000	City Budget
2.	Waynedale Spot Fill	$ 1,400	City Budget
3.	Boat Ramp	$ 3,000	City Budget
4.	Leave Flood-Fighting Fill	N/A	
5.	Oswego (North of Vance)	$ 2,500	City Budget
*B.	Repair to Pre-Flood Condition		
1.	Pemberton	$200,000	City Budget/COE
		$131,000	Public Law 84-99
2.	14 Miscellaneous Sections		
	a. Proof Rolling & Repair	$104,900	Public Law 84-99
	b. Tree Removal	$ 80,000	City Budget
C.	Increase Height		
*1.	Nebraska (some acquisition)	$250,000	State of Indiana
		$400,000	City Budget
*2.	Main to Clinton	$300,000	Park Bond
		$165,000	City Budget
3.	Spy Run/St. Joe	$600,000	State of Indiana
4.	Taylor Street	$ 90,000	State of Indiana
5.	Michigan Avenue	$ 90,000	State of Indiana
6.	Vesey Avenue	$ 90,000	State of Indiana
*D.	New Construction		
1.	Lagoon Dike	$ 52,000	City Utilities
2.	Sewer Treatment Plant	$ 49,200	City Utilities

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18 MONTH WORK PROGRAM (cont.)

		COST ESTIMATE	POTENTIAL FUNDING SOURCES
*III.	BACKWATER GATES		
	A. Spy Run Creek B. St. Joe River C. St. Marys River D. Maumee River E. Fairfield Ditch	$ 135,000	City Utilities
IV.	CHANNEL IMPROVEMENTS		
	A. Confluence Area	$ 400,000	State of Indiana
	*B. Traders Point (MESA)	$ 131,000	Park Bond
	C. Fairfield Ditch	$ 200,000	Allen County
	D. State Street	$ 120,000	Allen County
V.	ACQUISITION		
	*A. Fairmount Place ($350,000 over 6-year period)	$ 300,000	Community Development Block Grant
	B. Ross-Michael	$ 190,000	State of Indiana
	*C. Rivergreenway	$ 140,000	State of Indiana
		$ 93,000	Park Bond
VI.	PUMPING STATIONS		
	A. Tecumseh and Morton Street and Emergency Pumping Wells	$ 200,000	State of Indiana
VII.	DAMAGE SURVEY REPORTS		
	*A. Utilities	$ 1,334,900	City Utilities
	*B. Civil City	$ 364,200	City Budget
VIII.	FEDERAL EMERGENCY MANAGEMENT AGENCY		
		*$ 5,097,200	FEMA (public assistance)
	TOTAL	$11,309,300	

*Complete or funded

Attachment B

Excerpts From

White Paper 38
(pp. 2-3)

"Flood Hazard Mitigation 1984-88"
City of Fort Wayne

September 1983

1. Goal Statement

The Fort Wayne community needs a single authorized agency to implement a comprehensive flood control solution. This agency must be relentless and timeless in the pursuit of this long-term objective.

Program

The creation and implementation of a conservancy district.

2. Goal Statement

The Fort Wayne community needs to expedite a long-term flood control solution that will provide the greatest degree of protection to the area's flooding problems.

Program

Congressional appropriations through the U.S. Army Corps of Engineers flood control projects to implement major public works flood control projects like the Trier Ditch diversion channel.

3. Goal Statement

The Fort Wayne community needs to continue its efforts to achieve short-term solutions to the flooding problems that provide some degree of protection immediately.

Program

Develop additional Work Programs to compliment and extend the soon finished 18 Month Work Program.

4. Goal Statement

The Fort Wayne community needs to achieve wise use of flood hazard areas with the context of the built environment.

Program

Review, revise and update the existing floodplain zoning ordinance.

CHAPTER XV

CARDINGTON, OHIO

Background

On June 13, 1981, a devastating tornado swept through the central busines district of Cardington, Ohio. The twister hit the village of 1,700 residents at 3:23 on a stormy Saturday afternoon; by 3:25, four were dead and nearly 60 were injured. Damage to the village was extensive. The tornado buckled sidewalks, uprooted trees, toppled lamp posts, and cut gas, electric and telephone service to much of the village. It also destroyed or seriously damaged 21 houses, 17 mobile homes, 15 apartments, both the fire and police stations, and 29 of the village's 32 downtown businesses.

The damage was estimated at $4.2 million, an enormous loss for a village with an asessed real estatevalue of slightly less than $12 million. Damage to public property exceeded $1 million and damage to residential and commercial property approached $3 million. The resulting loss in tax revenues was estimated at $1.4 million.

The tornado of June 13 caught the residents of Cardington completely by surprise. They had little warning that the twister was approaching and virtually no time to protect their property. Moreover, 35% of the houses, 65% of the businesses, and 90% of the mobile homes that were damaged or destroyed were not adequately insured against such a disaster.

Response Phase

Local officials. Minutes after the storm had passed, village officials began to mobilize. The first to respond was the chief of police. He requested assistance from the Morrow County Sheriff; informed Columbia Gas of the ruptured mains; and, fearing explosions and

fires from random sparks, prohibited local residents from using gasoline-powered saws to clear debris.

The chief of police was also responsible for establishing an Emergency Operations Center (EOC) and a Disaster Assistance Center (DAC) in the gym at the village high school. The gym had sustained only minor damage and was sufficiently large to accommodate the scores of people requiring aid.* The chief was assisted by a highly capable local merchant who remained at the EOC for most of the week following the storm.

The mayor of Cardington played a significant role in the immediate response, as well. After assessing the damage, he established recovery priorities: first, ensure the safety of village residents; second, protect commercial property; third, protect residential property. These priorities guided the response phase of the disaster. Having set priorities, the mayor organized a "clearinghouse" for the hundreds of volunteers who came to Cardington to assist with search and rescue operations and debris removal. Located at the high school gym, the clearinghouse provided volunteers with specific work assignments and maps of the village. It was later determined that 162 farmers and neighbors from the surrounding countryside responded to help village residents. Many brought tools and heavy equipment which were used in debris removal activities.

On Saturday evening, the mayor ordered the chief of police to seal the village. He feared that unsupervised visitors might loot the damaged businesses and hamper the search for victims. Later that evening, the

*The Morrow County Disaster Plan designated the Cardington Methodist Church as the site for the DAC. The church, however, had been damaged by the storm and was not large enough to accommodate all of the disaster victims. Consequently, the EOC and the DAC were established at the high school gym.

mayor imposed a 9:00pm-7:00am curfew that remained in effect for 14 days. The curfew was enforced by the village's auxiliary police, who were assisted by the National Guard, the State Highway Patrol, and police from 18 neighboring towns that had mutual aid agreements with Cardington. To avoid confusing volunteer workers with people ignoring the curfew, the EOC issued passes stamped with the high school seal to all "authorized personnel."

The mayor of Cardington was the principal architect of the immediate response, even though he is a part-time official with a full-time job operating the local dairy. He met each day with key volunteers and members of the Village Council to review and coordinate response activities. On June 18, the Village Council unanmously approved Resolution 81-6, authorizing the mayor to act on behalf of the village in all matters concerning the disaster. Both the mayor and Council felt that the resolution would help the village to retain local control over response activities. Also on June 18, the Council adopted a resolution requiring the registration of all contractors soliciting business in Cardington. The resolution was suggested as a precautionary measure by an official from the State Office of the Attorney General. It, too, was passed unanimously.

Cardington's fire chief also was involved in the immediate response. He participated in search and rescue operations, worked at the EOC, and encouraged fire stations in nearby towns to send their pumpers as a precautionary measure.

Neighboring towns and villages. Cardington received much assistance from towns and villages throughout the area. For example, Mt. Gilead, Ohio, organized a disaster "hotline" that handled more than 350 incoming calls from concerned friends and relatives of Cardington residents. Other towns dispatched law enforcement officers and fire

equipment, while still others sent food, volunteer workers, and monetary contributions.

The State of Ohio. The State of Ohio responded quickly and dramatically to the disaster in Cardington. Within hours, Governor James A. Rhodes arrived in the village to assess the damage. He declared a "state of emergency," told local officials to specify the kinds of assistance the village would need, and assured residents that the state would provide whatever was required to guarantee the community's survival. Although the governor returned to Columbus late Saturday evening, he was back in the village the following day.

On Sunday, June 14, the governor began to mobilize the state's resources. A structural engineer from the Department of Economic and Community Development (DECD) was sent to help local officials determine which buildings were irreparably damaged. The Ohio Department of Transportation (ODOT) sent heavy equipment to begin clearing debris from the central business district. And the Ohio Department of Natural Resources (DNR) sent scores of workers into the village's residential areas. These state employees remained in Cardington for approximately ten days. The governor also mobilized the National Guard and the State Highway Patrol from Mansfield and Marion.

On Sunday evening, Governor Rhodes requested a Presidential Disaster Declaration.

Federal officials. Officials of the Federal Emergency Management Agency (FEMA) toured Cardington on Monday, June 16. The following morning, President Reagan issued a Disaster Declaration for Morrow County. Soon after the declaration was issued, Representative Bob Shamansky (D-Columbus) sent a member of his staff to the DAC to help village residents complete FEMA grant applications. FEMA also secured temporary housing in nearby towns for approximately a dozen residents

whose homes had been damaged by the storm. (Most of the displaced residents found shelter with friends or relatives.)

After the disaster declaration, a FEMA official held an open meeting in Mt. Gilead, Ohio, to inform residents of Cardington about the availability of federal aid. The ODOT official also offered the village two mobile homes for use as municipal offices. The mobile homes arrived on June 20.

Volunteer organizations. Volunteers from the American Red Cross arrived at the DAC less than two hours after the storm, bringing food, clothing, medical supplies, and other necessities. Remaining in the village for slightly more than a week, these volunteers prepared thousands of meals, coordinated the relief activities of various church groups, and provided shelter for residents whose homes had been damaged and who were waiting for assistance from FEMA.

The Friends and Mennonite Disaster Services also responded with volunteer workers. These people from Ohio and Pennsylvania cleared debris from business and residential areas and completed pressing emergency repairs. The Salvation Army established canteens to help feed the volunteer workers, the Morrow County Squad Association transported injured residents to the Morrow County Hospital, and scores of civic organizations sent contributions to the newly created Cardington Tornado Relief Fund.

Recovery Activities

By the end of June, the people of Cardington were turning their attention from "response" to "recovery." Much of the debris had been cleared and public utilities were again functioning normally. On June 19, ODOT, DNR, and most of the volunteer workers left the village. Several days later, the mayor lifted the curfew.

Early in July, village officials worked with FEMA to complete the Disaster Survey Reports (DSRs) required by the agency. Officials from Xenia, Ohio (a town that had been shattered by a tornado in 1974) helped to prepare federal grant applications, and state officials at the DAC helped local residents complete applications for SBA loans.

Cardington received additional assistance from the DECD Office of Grants Management, which provided the village with an extremely knowledgeable, dedicated, compassionate, and competent representative who remained in Cardington almost full-time for several months. During those months, she enabled the village to secure a DECD grant for a new municipal building that would replace the firehouse, the police station, and the mayor's office, all of which had been destroyed by the tornado.

In early August, the mayor organized a five-member Tree Committee. As its name suggests, the committee was charged with replacing trees splintered by the storm. Over the next several months, more than 120 trees were planted. Later in August, the mayor organized the Green Dump Committee. Staffed by four volunteers, it was responsible for disposing of the scores of felled trees that had been piled by ODOT and DNR on a privately owned seven-acre lot near the edge of the village. Ultimately, the committee decided to cut the trees into firewood and to sell it locally. Profit from the firewood was divided among the owner of the land, the fire department, and the Cardington Tornado Relief Fund.

Once the immediate response was completed, the people of Cardington were primarily interested in replacing or repairing their personal property and piecing together their shattered lives. They were eager to put the tornado behind them. Consequently, there were relatively few recovery priorities that affected the entire community. In other words, Cardington's recovery was marked more by **personal** than by **village**

priorities. Despite this emphasis on personal priorities, village officials confronted at least one community-wide issue. It was raised at the end of June when the Village Council discussed the need for a comprehensive land use plan for the village's central business district.

The idea for a plan originated with several of the younger, more progressive local merchants who had visions of transforming Cardington from a crossroads village into a "regional attraction" for area shoppers. These merchants realized that many of the buildings destroyed by the storm were decaying remnants of past generations. They also realized that the tornado provided Cardington with an opportunity to revitalize its business district using state and fedral, rather than local funds. In short, these younger merchants saw the tornado as a catalyst that would spark development and increase local revenues. They believed a plan was necessary to ensure that the business district was developed appropriately.

Enthusiasm for a land use plan was not universal. In fact, a majority of the village's older merchants opposedthe idea; they were interested in rebuilding and reopening their businesses as soon as possible, they objected to the imposition of building constraints, and they feared that any delay in demonstrating that Cardington had survived the disaster would result in the permanent loss of customers to competitors in other towns.

These sentiments notwithstanding, the Village Council voted to request a DECD planning grant and to solicit bids fromplanning firms throughout Ohio. The request was made of the governor at a televised village meeting. During the week following the request, the governor, a state legislator, village officials, and several village residents discussed the need for the grant. Ultimately, the governor assented and persuaded the State Controlling Board to release $93,000.

With the request for the planning grant approved, the mayor of Cardington selected "volunteers" for a 15-member ad hoc advisory committee. The committee reported to the local Planning Commission (which existed prior to the tornado) and concentrated its planning activities in five areas: the central business district, housing, parks and recreation, industrial development, and capital improvements. The committee was also responsible for assisting the Planning Commission with the selection of a planning firm, with organizing the information the selected firm needed to complete the plan, and with ensuring that the plan adequately reflected local ideas and community preferences.

Early in July, the Village Council issued a "request for proposals." Twenty-six firms responded, six were invited to a screening by the Planning Commission, and at the end of July, both the Planning Commission and the Advisory Council recommended to the Village Council that a firm from Cincinnati, Ohio, be selected. The firm was chosen, in part, because it was eager to involve local residents in data-gathering tasks. Early in August, the Village Council let the contract to the firm in Cincinnati. It then organized a town meeting to explain to local residents the purpose of the forthcoming land use plan.

The land use plan prepared by the Cincinnati firm was completed in June of 1982, months behind schedule and fully one year after much of the village had been leveled. By then, more than a dozen merchants had already rebuilt and reopened their businesses, unwilling to wait for the plan's completion. In short, the carefully conceived and innovative plan was of little practical value because it was not completed in a timely fashion and was not widely supported by those who were ultimately responsible for its implementation. Moreover, the absence in Cardington of land use ordinances, local building codes, and zoning regulations

meant that local officials did not have the tools to slow or suspend rebuilding until the plan was completed.

Several of Cardington's more savvy merchants supportd the planning grant request but realized **before** the request was approved that a land-use plan had little chance of guiding the village's recovery. They supported the request bcause the grant would enable the village to hire the clerical personnel it needed to complete the enormous volume of paperwork required by FEMA.

Less than a year after it was created, the 15-member ad hoc advisory council was dissolved and its functions delegated to the Community Improvement Corporation. Composed of local business leaders, the corporation existed prior to the tornado but had not been especially active.

An Overview

Cardington survived the tornado because a relatively small group of part-time officials and dedicated residents effectively organized the resources provided to the community by a variety of local, state, federal, and volunteer agencies. This tenacious group endured the frustrations of working with government bureaucracies, encouraging officials to deliver the assistance that was promised in a timely fashion. One example of that tenacity is seen in the scores of telephone calls from Cardington's fire chief to Governor Rhodes. (The governor had promised to replace the village's fire equipment. When the new equipment was slow to arrive, the chief made sure that the governor knew about it.) Moreover, Cardington's leaders clearly understood that their efforts to secure assistance should be directed at those agencies with tangible resources at their disposal. They recognized, for instance, that the governor, and not their congress member, had direct

control over the machines and personnel needed to respond to the emergency.

A second explanation for Cardington's recovery can be found in the flood of support from individuals and organizations across Ohio. Hundreds of volunteers contributed time and labor to the immediate response, while hundreds of others contributed money to the Cardington Tornado Relief Fund.

A third explanation for Cardington's recovery is the assistance the village received from the State of Ohio. For reasons that remain unclear, the governor took a highly personal, almost avuncular interest in the tiny village. He visited Cardington frequently, ordered members of his cabinet to provide virtually all of the resources requested, and persuaded the State Controlling Board to authorize funds for a variety of grants. Moreover, both the governor and the official from the Office of Grants Mangement continually reassured village residents that they were **personally** committed to the community's welfare. This level of commitment was probably a function of the personalities involved; it was not one of the state's standard procedures for handling natural disasters.

Financial Assistance

Since June 13, 1981, Cardington, Ohio has received nearly $1 million in state and federal grants. Specifically, the village secured:

- $269,000 from DECD for a municipal building;
- $29,000 from DECD for counseling and other mental health services;
- $17,600 from DECD for emergency police protection;
- $300,000 from the HUD Discretionary Fund; and
- $183,000 from FEMA for the replacement of public facilities.

Additionally, the village received low-interest loans from the SBA and more than $40,000 in unsolicited contributions which were used for individual assistance grants and minor village projects. The village took no extraordinary measures--such as issuing bonds--to finance the recovery.

As of June 30, 1982, Cardington had received 100% of its state grants and 75% of its grants from FEMA. This relatively short reimbursement period, coupled with a preference to move slowly on several village projects, explains why the village has not experienced a "cash flow" problem.

Local-State Relations

As detailed above, Cardington fared unusually well in its postdisaster dealings with the state. Village residents were grateful for and pleased with the assistance they received and continue to praise the efforts of most state officials. The only complaint registered by several village residents involved the leveling of the severely damaged businesses. These residents felt that the ODOT crews did not allow sufficient time for removing personal property before their buildings were demolished.

Local-Federal Relations

Village officials had few complaints about the assistance they received from FEMA. They were pleased with how quickly FEMA responded to their immediate needs and with the dollar amounts the agency approved for the DSRs. They also were pleased with the timeliness of FEMA reimbursements.

Nevertheless, several officials commented that FEMA was insensitive to disaster victims; that FEMA paperwork was excessive; that the agency should have processed supplemental DSRs more quickly; and that temporary housing was located too far from Cardington. In sum, it appears that

FEMA responded to the disaster in textbook fashion, while the state's response was considerably more personal and compassionate.

Recommendations

Village officials had words of advice for their counterparts in other towns:

1) Local officials should retain control of all recovery activities. Under no circumstances should state or federal officials be allowed to direct the recovery process.

2) Requests for assistance should be as specific as possible. More general requests are processed less quickly and often result in assistance that is neither desirable nor appropriate.

3) Requests for assistance should be addressed to agencies and organizations that have direct control over desired resources. (For example, it was obvious to officials in Cardington that state officials, and the governor in particular, had control over more of the resources necessary during the immediate response than did their federal legislators. Consequently, village officials devoted much of their time to contacting the office of the governor.)

4) Local officials must be persistent if they are to receive all of the assistance they have been promised. They should not be reluctant to inquire repeatedly about the status of specific requests.

5) Local residents should be involved in all recovery decisions, for citizen participation is likely to improve the chances that decisions will be implemented effectively.

6) Local officials should maintain detailed records of every expenditure. Incomplete records will complicate the local relationship with FEMA.

7) Local officials should be aware of the ex officio authority they possess in extraordinary circumstances. This is especially important for officials responsible for the delivery of emergency services.

8) Disaster plans should be reviewed annually by all relevant officials. Such a review would familiarize officials with their roles and responsibilities.

9) Finally, the official responsible for orchestrating both the response and the recovery should recognize the importance of **organizing** available resources. In Cardington, the clearinghouse for volunteers and the

frequent meetings of the Village Council suggest that local officials understood that the community's survival hinged, in part, on a well-organized response.

Mitigation

Although much of Cardington was destroyed by the tornado on June 13, village officials seem unconcerned with mitigation. Few shelters have been built and no zoning or land use ordinances have been adopted. In fact, the only significant difference in the way the village looks now is the absence of three-story buildings. It should be noted, however, that the absence of these buildings is due less to concern about another tornado than to the limited funds available for rebuilding. Also, the Village Council adopted an ordinance prohibiting trailers from locating in the central business district on lots previously occupied by commercial buildings. The motivation for this ordinance was purely aesthetic.

Interviewers' Perceptions

More than a year after the devastating tornado swept through Cardington, the village had not recovered fully. Construction was visible throughout the business district, many of the structures destroyed by the storm had not been replaced, and village children remained frightened by inclement weather. Moreover, most of the residents who were placed in temporary housing by FEMA had chosen not to return to Cardington.

Nevertheless, many residents view the tornado as a "blessing in disguise," for it has left the village with a revitalized business district. Had it not been for the storm, many merchants would not have been able to replace their vintage structures with modern ones. The tornado also imbued the people of Cardington with a sense of community that previously did not exist. Although some claim that much of the

initial camaraderie is no longer present, most agree that village residents remain closely knit.

The tornado has given Cardington a statewide identity. It has, in effect, made "Cardington" a household word. This delights village officials because they believe that such acclaim will encourage commercial developers to purchase land in the Cardington Industrial Park, a large, mostly vacant tract of land that has not been developed because of a generally poor economy and a shortage of funds for bringing utilities to the area.

Finally, the tornado of June 13 has left the village with a new generation of political leadership. Indeed, several of the residents who contributed so mightily during the weeks and months following the storm are now elected village officials. Because these individuals are younger and more progressive than their predecessors, the Cardington of 1990 will probably look very different from what it might have had the tornado touched down elsewhere.

CHAPTER XVI

PARIS, TEXAS

Background

Paris, Texas, a city of 26,000 people, is located approximately 120 miles northeast of Dallas. Paris is a regional center serving agricultural interests in both northeast Texas and southeast Oklahoma. Paris has a diverse industrial base which includes Campbell Soup, Westingnouse Electric, and Babcox and Wilcox. As of August, 1982, the unemployment rate in Paris was an enviable 6.5%. Paris is the county seat of Lamar County.

On the morning of April 2, 1982, the National Weather Service issued a tornado watch for parts of northeast Texas, including Lamar County. The city of Paris deployed Public Safety personnel as weather spotters around the city until about noon, when the watch was cancelled. At 3:00pm a tornado watch was in effect again for Lamar County, and by 3:20pm a tornado was spotted approaching Paris from the west. The city's warning plan was activated. Every municipal vehicle with a siren was used to run predetermined routes warning residents of the danger. The warnings began at 3:44pm; each route was covered in six to eight minutes and then run a second time. At 4:00pm, a tornado travelling at 50 miles per hour swept through the northern half of the city from west to east, leaving a path of destruction 1/2 mile wide and almost five miles long. In less than five minutes the tornado damaged or destroyed 1,329 homes, destroyed two businesses and damaged 35 others. In addition, there were 12 deaths, 180 injuries, and damages totalling $50 million.

As a result of the damage, 10% of the city's population was left homeless. Fortunately, the tornado passed north of the central business

district and spared all but two businesses (American Box Company and the Paris Lumber Company). The greatest impact was in the residential areas of the city. The tornado destroyed a large number of low-income, both owner-occupied and rental properties on the west side of the city and also some newer, more expensive homes on the east side of the city. There was little damage to schools and public facilities, but six churches were damaged or destroyed. The tornado just missed the city's water tower, the loss of which would have had a significant impact on the city's residents and workers. As an example, the city's largest industrial employer is Campbell Soup, which employs 1,700 people and uses six million gallons of city water daily.

Although this was the first time Paris had been struck by a tornado, Paris has been the scene of previous disasters. Two fires, the first in 1877 and the second on March 21, 1916, severely damaged the city. The fire of 1916, known as "The Great Paris Fire," resulted in $15 million dollars in property damage and affected 270 acres in the downtown area. The president of the Chamber of Commerce displayed a "smile" sign in the fire debris. Following the tornado, the Paris, Lamar County Chamber of Commerce displayed the original "smile" sign from the 1916 fire to foster the same spirit of recovery. Eleven months before the tornado in Paris, a tornado destroyed the town of Emberson, Texas, also in Lamar County.

Response Phase

As the tornado moved in an easterly direction out of the city limits, Public Safety units converged on the disaster scene. The city's Emergency Operations Center was activated in the court room located in the Police Department, according to the city's disaster plan. The Police Department did not lose power or telephone services.

The Fire Department encountered a number of difficulties in responding: the central fire station lost power, telephone service, and the use of their repeater-based communications system. Individual fire units responded spontaneously to the disaster scene and began search and rescue operations. The city fire units could have communicated on a simplex channel, but many units did not switch channels. The response of the Fire Department was made easier by the fact that only one fire was reported and that one request for mutual assistance had been transmitted before utilities were lost. Fire, police, and ambulance units from as far away as Dallas responded to Paris, in most cases without a request being made. Search and rescue operations continued into the evening of April 2nd.

The Police Department secured the disaster site with the assistance of 80 Texas Department of Public Safety (DPS) officers. The DPS had responded at the request of the local detachment. The DPS also requested assistance from the National Guard. As in other disasters, the National Guard interacted only with the State Police organization. This caused a personnel shortage because, by agreement, the DPS secured the east half of the diaster site while the Paris Police Department, with a total of 33 officers, was left to secure the west side. This problem came to light when the city police chief asked the DPS commander for additional assistance to secure intersections in west Paris. The National Guard personnel were all on the east side with the DPS. When the imbalance was discovered, National Guard personnel were teamed with city officers to secure the entire disaster area. Although there was initial fear about looting, only two cases were reported.

In order to secure the tornado-stricken area, a pass system was instituted to allow the residents of the area to return to their homes. Although the pass system was included in the city's emergency

plan, the system was not adequate considering the large disaster impact area. As part of its preparedness efforts, the city had printed 1,500 passes, but as many as 12,000 were ultimately needed. The issuing of passes required six to eight people who worked out of the City Water Office across from City Hall. On the evening of the disaster, a curfew was put in force. It lasted for one week, and was never officially repealed; enforcement was just eased until it was no longer needed.

After search-and-rescue operations had been completed, the next big problem for the city was debris removal. The city was assisted by the local Army Reserve Construction Unit; all volunteers wishing to help with the clean-up were directed to the Army Reserve Center. The center became the staging area for personnel and equipment used in the initial debris removal. Volunteer and city crews removed debris not only from city streets, but also from private property when the owner would sign a release form. There was reluctance on the part of some homeowners to sign releases for fear that their houses would be removed. The fire chief, in an interview with the local newspaper, explained that only debris which the owner listed on the release would be removed. By centralizing debris removal operations at the Army Reserve Center, the city was able to separate its public works disaster operations from its normal activities. This division of functions was helpful to the city's public works director. In this way he could control both normal and disaster operations.

Recovery Activities

As mentioned earlier, most of the damage was in Paris' residential areas. Both single and multi-family dwellings were damaged or destroyed. The array of recovery issues was significant. First, it was necessary to find shelter for the homeless. Although community shelter

facilities were made available, most of the homeless found shelter with relatives and friends. Mobile homes were brought in by FEMA following the Presidential Disaster Declaration on April 8, 1982. Other shorter-term recovery needs were debris removal, street and facility repair, and coordination of the repair or reconstruction of damaged residences. Soon after the tornado hit, the City Council acted to prevent price gouging and to prevent unscrupulous contractors from taking advantage of the displaced homeowners who were anxious to rebuild their houses.

Debris removal was a difficult task because it was necessary to obtain permission to enter property beyond the public right-of-way. The city initiated an emergency bidding process for this major task. By the time the contract for this work was let, the City Public Works Department already had completed a substantial amount of debris removal and made the necessary arrangements for dumping and disposing of the debris.

Debris removal was perhaps the largest single short-term task. The Paris Times of April 12, 1982, reported the volume of debris to be approximately 300 thousand cubic yards--enough to cover a football field to a height of 15 stories. Disaster relief assistance for this task came from the Federal Emergency Management Agency under a 75%/25% funding arrangement. Street and minor facility repair work was done by the Public Works Department. Some of this work was scheduled as part of the proposed Community Development Block Grant project approved by the Paris City Council at a special meeting on November 1, 1982.

Reconstruction of residential areas began soon after the disaster, with the assistance of FEMA, the Red Cross, the Mennonite Disaster Services, and others. FEMA brought in 84 mobile homes and ten travel trailers to be used as temporary residences. These were in place by April 27, 1982. At the time of writing, November, 1982, FEMA employees

were still in Paris administering this part of the assistance program. The Red Cross effort in reconstruction was significant: the American Red Cross spent $1,036,000 assisting families in the Paris and Lamar County areas affected by the tornado. With the aid of the Mennonites and others, the Red Cross built 30 homes, repaired substantial damages on 13 homes, and repaired minor damage on more than 300 homes. It also purchased mobile homes, single-family homes, and repaired nine mobile homes. Most of the Red Cross assistance centered on the lower-income housing units on the west side of the city. Unlike most of the residents on the east side of Paris, residents of west Paris were not covered by insurance. The Red Cross was the major source of assistance for west Paris until the Interfaith Disaster Services organization was formed in May.

Red Cross assistance in rebuilding was available only to homeowners, not to renants. Assistance was made on a case-by-case basis, permitting a variety of options such as rebuilding, rehabilitating, and add-on construction for persons planning to move in with relatives. This organization also provided occupational supplies, medical assistance, food, and clothing to homeowners and renters. As of November 1, 1982, Paris officials estimated that approximately 85% of the housing units that will be rebuilt or repaired are complete.

In addition to federal, state, Red Cross, and other assistance such as a substantial amount of private assistance was made available through Interfaith, Inc., a non-profit organization established in May of 1982, to coordinate the various efforts to provide this type of assistance. Operating with a small full-time staff and a number of volunteers, Interfaith Disaster Services of Paris and Lamar County (IDS) provided a full range of assistance services to diaster victims: repairs, clothes, heaters, blankets, food, utility payments, delinquent tax bills, and

counseling. IDS worked closely in the reconstruction effort with the Red Cross and other disaster relief organizations. Although the IDS budgeted $5,000 for crisis counseling, it is interesting to note that the money has not been spent because of a lack of demand for counseling services.

As of October, 1982, the projected 18-month budget for IDS was $495,000. Nearly one-third of this was for home repairs, with other substantial amounts budgeted for furniture and appliances, medical assistance, and business assistance (many small business operations were affected by the tornado). The initiative for establishing IDS came from a delegation of officials from Wichita Falls, Texas, which had experienced a devastating tornado several years earlier. The Wichita Falls officials made themselves available to offer assistance and guidance shortly following the disaster.

The most important long-term recovery issue was housing. Paris officials did not expect the conversion of the mobile homes from temporary to permanent residences; consequently, the tract on which these structures were placed was rezoned to accommodate them for one year. The preparation of a prospective award of a new Community Development Block Grant (CDBG) project (from the U.S. Department of Housing and Urban Development), coupled with the continuation and expansion of HUD's Section 8 program in Paris, is a significant effort for long-term recovery and community improvement. Working with the Planning and Community Development officials of Paris, the Ark-Tex Council of Government developed a CDBG proposal for $800,000. This proposed project would, if fully implemented, substantially improve the housing stock and public infrastructure in the community, particularly in the heavily damaged lower-income neighborhoods on the west side of the city.

The CDBG proposal identified eight major activities, summarized as follows:

1) Rehabilitating 46 substandard units of owner-occupied housing, bringing the units up to city building code standards (which meet or exceed HUD program standards).

2) Rehabilitating 20 units of substandard rental housing outside areas of minority and/or low-income concentrations. It is this proposed activity which will operate in tandem with the Section 8 Existing/Moderate Rehabilitation Program previously approved in Paris. This activity also will focus both on the deconcentration requirement and assisting those persons displaced by the tornado. It also is expected that this actiity will achieve a favorable leveraging ratio and via a loan mechanism will provide the local government a means of creating an on-going rehabilitation program.

3) Emergency repairs to 30 units of substandard housing (grants).

4) Demolition of 36 vacant dilapidated structures. This activity is part of the proposed project; itis to be funded by FEMA and local funds.

5) Code enforcement (reinstituted) of local codes in the area of tornado damage, with local funds.

6) Street and drainage improvements, primarily in the area along the north side of Paris.

7) Installation of water and sanitary sewage lines to relieve service disruption due to tornado clean-up on existing lines.

8) Project administration by the City of Paris; utilization of consulting services for housing program activities.

Activities 1 and 2 represent the largest commitment to community betterment; they account for more than half of the CDBG funds requested and they require $120,000 of other funds. The community may be able to expand its housing stock by approximately 100 additional units with the Section 8 program, creating better housing opportunities for citizens who meet the program's eligibility requirements. Overall, the Ark-Tex COG manager for Existing Housing feels that the results of these coordinated efforts will provide "decent housing for folks who would never have had it. . . ."

At one point, the loss of the American Box Company plant was expected to create some economic hardships for community residents, and the city officials contemplated pursuing federal funding to minimize this loss. However, the planned location of a larger plant by the Kimberly-Clark Corporation has made the loss of the box company plant much less of a hardship.

In summary, community recovery in Paris is proceeding steadily, both in terms of the needs of disaster victims and the stabilization of the local economy. It should be emphasized that various voluntary groups have played the key role in shorter-term recovery. The city's efforts (along with the Ark-Tex COG) complement the short-term effort to restore and improve housing and the related public infrastructure.

Mitigation Measures

The tornado has been the driving force for recent local mitigation efforts. Although the city's emergency plan worked well, it was revised to eliminate problems that arose during the tornado response phase.

Several major preparedness improvements are now underway in Paris, the most important of which is a new fixed-site siren warning system. The new five-siren system eliminates the need for public safety personnel to use mobile sirens to warn city residents of an approaching tornado. The system will not only increase the speed of warning but also lower the risk to public safety personnel and city emergency vehicles. The new warning system will consist of four directional rotating-type sirens (each is rated at 135 dbc output) and one smaller directional siren (rated at 125 dbc output). Each siren will be mounted on a 55' to 60' pole. The four larger sirens will be positioned so that their output overlaps the densest parts of the city. The smaller siren will be located in the southeast, where the population is less dense.

The city emergency management coordinator had budgeted for this new siren system twice in the past, but both times the City Council deleted the budget item. At budget hearings in June following the tornado, a fixed warning system was approved. Bids were open in July which resulted in the city acquiring a five-siren system at a cost of approximately $90,000.

A second enhancement to the warning system (which was also started before the tornado) is now fully operational. Warnings can now be immediately disseminated to all cable television subscribers by the emergency coordinator at the Emergency Operations Center or by the dispatcher at the Police Department. At both locations, tone control signals can be transmitted over phone lines to the cable transmitter site. These signals interupt normal cable programming and the warning is then transmitted directly from the Emergency Operations Center or Police Department to all cable subscribers. Although the television must be turned on to receive this warning, it is estimated that 90% of the city's population are cable subscribers, which increases the potential value of this system.

The city's emergency response capability has also been enhanced by the relocation of the Emergency Operations Center from the Police Department building to the basement of City Hall. During the immediate response phase following the tornado, the police building became the staging area for mutual aid law enforcement personnel. Consequently, it became difficult to limit access to the EOC. In addition, key department heads (fire chief, police chief, and public works director) indicated a preference for being in the field. On-the-scene control is necessary because of the small size of the municipal work force.

Because of the lessons learned in the disaster response, the emergency coordinator decided to move the EOC to the basement of City

Hall in space that was formerly occupied by a large holding cell. The area was renovated and communication equipment was installed at a cost to the city of $12,000. The new EOC is well-suited for access control. It will be used as a coordination center and individual department heads will work out of their offices or from the field.

Another important mitigation measure implemented by the emergency coordinator as a result of the tornado is a public awareness campaign. Tornado awareness pamphlets will be distributed to city residents and a city building inspector has been assigned to assist the emergency coordinator. The inspector's first assignment was to present a tornado awareness program in the city's school system.

The state's 406 Plan prepared in response to the Presidential Disaster Declaration reviewed the above mitigation measures and also made recommendations to other localities within the county that had been stricken by the disaster. However, it only addressed tornado mitigation.

Interviewers' Perceptions

Despite the fact that the coordinator of emergency management in Paris is only a part-time position (the incumbent also is director of parks and recreation), the city has above-average emergency planning and management capability. The coordinator actively pursues improvement in the emergency management function and had an emergency scenario exercise planned when the tornado struck. After the disaster struck, the city provided local funds for an improved warning system and emergency operations center.

Local public capacity has been somewhat improved by shifting emergency management personnel assignments, but except for the warning system and emergency operations center allocations, no further resource

commitments appear likely. More effective utilization of existing personnel and other resources, particularly volunteers, may help stabilize this situation. In addition, the coordinator is undertaking a significant tornado public awareness program.

In the wake of the April tornado, the only ad hoc group to emerge was the Interfaith Disaster Services. As explained, the formation of this organization came about largely as the result of suggestions from the officials of Wichita Falls, Texas. IDS, together with national disaster relief organizations, played the major role in providing assistance to individuals after the disaster.

With the increasingly stringent requirements for obtaining a Presidential Declaration, and the narrowing scope of public assistnace made available by them, it would appear that voluntary agencies and emergent organizations may have to increase their contributions to the disaster recovery effort.

CHAPTER XVII

ESTES PARK, COLORADO

Background

Estes Park is a summer resort community located at the gateway to the Rocky Mountain National Park, about 60 miles northwest of Denver. Its permanent population of 2,700 persons depends primarily on tourism for its income. The town receives almost half of its annual income between July 15 and September 1 each year. The permanent population inside the town limits, with another 2,500 in the immediate valley, swells to 40,000-50,000 persons a day in the summer. The town has a budget of about $9.5 million and about 75 municipal employees.

Description of the Disaster*

On July 15, 1982, at about daybreak (5:30am), the privately owned Lawn Lake Dam, located within the Rocky Mountain National Park, failed. Constructed in 1903, the earthen dam was 24 feet high and had a storage capacity of 817 acre-feet. The dam was four air miles from the nearest road, making it difficult to reach for inspection.

When the dam failed, the water flowed along the Roaring River into Fall River. After the water reached Cascade Lake, it caused a second, very small dam (the Cascade Dam) to fail. The flood waters then flowed into the Big Thompson River before entering Lake Estes (about 13 miles downstream from the Lawn Lake Dam). Lake Estes is located one mile downstream from the heart of the resort community of Estes Park.

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*This description is derived from the excellent, detailed account contained in the report "The Lawn Lake Dam Failure; a Description of the Major Flooding Events and an Evaluation of the Warning Process," prepared by Wayne J. Graham and Curtis A. Brown, U.S. Department of the Interior, Bureau of Reclamation, Denver, Colorado, December, 1982.

There were few people at risk upstream from Cascade Lake Dam, but downstream there were several thousand people whose lives were in danger. There were 275 people camped in the Aspenglen Campground, one half of a mile downstream from Cascade Dam. Downstream from Aspenglen Campground, more than a thousand people were at risk, including residents and tourists in cabins, trailer, and houses near the bank of Fall River. Many more were lodged in motel units, which are especially dense in the area near Estes Park. Motels, businesses, houses, mobile homes and other structures located on the Fall River flood plain were inundated with up to five feet of floodwater as a result of the failures of the two dams.

The Estes Park Chief of Police estimated that 4,000 to 5,000 people could have been killed if the dissemination of warnings and the subsequent evacuation had not taken place. In fact, the flood claimed the lives of three people.

The property damage resulting from the dam failures and floods was as follows, according to the Estes Park Trail Gazette:

- Private Sector--$19 million (including economic losses)
- Public Sector (state, county, and local)--$4.1 million
  Town Disaster Damages:
  Public Works--$588,000
  Light and Power--$1.3 million
  Water Department--$57,000

  Rocky Mountain National Park (federal)--additional $5 million

While the flooding was brief, lasting only a few hours, it was of unprecedented severity--greater than the 500-year flood. The flood waters washed away 18 bridges, destroyed road systems, inundated 177 businesses and 108 residences. Also destroyed were a hydroelectric plant and a fish hatchery.

Response Phase

The immediate response to the dam break included 1) detection of the dam failure, 2) dissemination of warnings, and 3) response to the warnings. The Lawn Lake Dam was unattended and contained no instrumentation which could be used to detect an impending or actual dam failure. Fortunately, a truck driver heard some noise at the Lawn Lake trailhead while colleting trash at that location, and he used an emergency telephone to report his observation to the National Park Service Dispatch Center. The decisions regarding when and how warning should be given and to whom were made by officials of Rocky Mountain National Park, Larimer County, and Estes Park.

Residents of downtown Estes Park became aware of the dam failure from law enforcement officials, radio, friends and neighbors. Most people received alerts from ten minutes to one hour before the water reached downtown Estes Park. Prompt and appropriate response to the warnings helped reduce the number of injuries and fatalities. Most individuals quickly evacuated the area. Howver, some ran toward the river to take photographs as the floodwaters approached. A few refused to leave when warned. "We were standing in the street, yelling at the dummies to get out of there," a Larimer County sheriff said. "They saw the cars floating toward them and then they decided to move."

An evaluation of the warning proces, done by Graham and Brown, stated "early detection of the dam failure, coupled with alerts, warnings, and evacuation orders issued by local law enforcement officials and carried over Estes Park's only radio station, possibly saved hundreds of lives. Little time was available to reduce losses to tangible property."

The following factors contributed to the success of the warning and evacuation. The distinction is made between controllable and non-

controllable factors to show which conditions public officials could (or could not) influence or affect in this particular disaster.

- Not Controllable:

  1) Time of day - the flooding occurred in the daylight and reached Estes Park before work hours.

  2) Weather - clear and dry weather made the response easier.

  3) Topography - loud, turbulent flow on Roaring River allowed the flood to be detected from a distance. Also, in Horseshoe Park, an uninhabited area slightly west of the Aspenglen Campground, the flood wave fanned out and slowed down somewhat, giving officials time to judge the magnitude of the event and prepare to warn the public.

  4) Communications - having a single radio station in Estes Park also helped. Telephone communications remained in operation until the flood hit the town.

  5) Building type - the clustered residences (motels, cottages) aided in effective evacuation. Warnings could reach people staying there more quickly than if people were spread out in many low-density campgrounds.

  6) Flood awareness - previous experience with the flash flood in the nearby Big Thompson Canyon in 1976 probably enabled more efficient warnings and evacuation orders being issued and a more appropriate response among the people in the path of the floodwaters.

- Controllable Factors:

  1) Early detection - a number of fortuitous events occurred to facilitate early detection and warning.

  2) Multiple warnings - personal contacts, radio warnings and police warning efforts reached almost everyone who might be affected by the flooding.

  3) Method of warning - nearly every motel or resort complex owner/manager received a warning from a sheriff or police officer. Many of the warnings were issued face-to-face and by telephone.

Local preparedness plan. During the emergency, the town used the emergency plan prepoared by Larimer County and coordinated its efforts with the county emergency coordinator. In Estes Park, the police chief

serves as the emergency coordinator. In Larimer County, the emergency preparedness coordinator is part of the county sheriff's department (the latter is an elected position).*

Since the 1982 flood, the police chief has taken the lead role in preparing an all-hazards preparedness plan for the town in order to be better organized at the local level next time. Town-level preparedness planning had been urged by the disaster recovery manager, a position that will be explained later. The town's preparedness plan was near completion in July of 1983, the time of the field visit.

Historical context. On July 31, 1976, a violent thunderstorm stalled and dropped more than ten inches of rain over the eastern portion of Estes Park. The rain and run-off drained through the Big Thompson Canyon, which is northeast of Estes Park and within Larimer County. The unexpected summer flood struck after dark, causing numerous deaths and massive destruction. Along a 20-mile stretch where the canyon is narrow, the floodwaters and debris breached and mostly destroyed the interstate highway, clogged and destroyed bridges, wrecked hundreds of cars and campers, and killed 139 people. The speed and intensity of the Big Thompson Canyon flood, together with the huge wake of destruction, left an indelible impression on the county residents.

Since the 1976 Big Thompson Canyon flood, only the Estes Park public works director was new; all other key town personnel--the mayor, town administrator, finance director--were the same in 1982 as they were in 1976. Consequently, there were both personal and institutional memories in Estes Park of that very dramatic and destructive recent

*Within Larimer County, there are four other municipalities in addition to Estes Park. While the town officials consider town/county coordination adequate, there do not seem to be regular meetings between them. The five local emergency preparedness coordinators within Larimer County do not meet routinely with each other or with their county-level counterpart.

flood in the county. The same county emergency coordinator was also in office in 1976 and in 1982.

In addition to the town/county relationship, the town has a mutual aid agreement with the Rocky Mountain National Park, a relationship that comes into play most often for fire fighting.

Recovery Activities

The flood caused by the dam failure was relatively brief, lasting only a matter of hours. Because of the brevity of the event, the response and recovery phases began immediately.

The inundation area for the flood resulting from the Lawn Lake Dam failure extended beyond the 500-year flood plain, catching many property owners without adequate insurance. At the time of the flood, very few flood insurance policies were in effect. Only about 20 people affected by the Lawn Lake flood were expected to be covered by flood insurance.

Local Public Priorities

The town officials quickly realized what the recovery process would entail. Their understanding was enhanced by memory of the paperwork and other requirements in the aftermath of the 1976 flood, and offers of assistance from about 20 agencies (mainly federal) within a week after the event. As the town's public works director commented, the first meeting of the Hazard Mitigation Team brought home to him the fact that he could not perform his regular duties (which were at their peak in July) **and** be responsible for managing the disaster recovery. The town administrator and the finance director also realized that they would need special assistance to deal with the recovery process. The major initial recovery concerns included planning the reconstruction of the central business district, processing Damage Survey Reports (DSRs),

applying for state and federal assistance, and relocating residences and businesses out of the flood plain.

To cope with the demands of the recovery process and to take full advantage of the federal assistance they were eligible for under a Presidential Disaster Declaration, the town decided to hire a person to work full-time as the disaster recovery manager. Robert Kistner, an emergency management specialist/community planner who was newly retired from the FEMA Regional Office in Denver, was selected to be disaster recovery manager about six weeks after the flood. Kistner, who was hired for a one-year period, worked directly under the town administrator.

Kistner brought some very special expertise to the town, including knowledge of and experience with federal agencies, which was particularly helpful to a small town in obtaining programs and funds which town officials ordinarily would not know about. Further, he had both the expertise and contacts to prepare the paperwork and subsequently land numerous grants. In the Estes Park Trail Gazette, one year after the flood, Kistner observed:

> Most communities simply don't have the expertise to apply for grants and do all the paperwork. Usually the staff and mitigation responsibilities lead to hating the feds, but I helped fill a buffer-liaison role, which enabled us to follow all items on the mitigation report, which was completed to everyone's satisfaction.

Kistner, in his role as disaster recovery manager, was highly regarded and appreciated by all of the public and private sector representatives interviewed, according to the Estes Park Trail Gazette.

> Kistner's abilities were perhaps best illustrated by his success in obtaining a $400,000 'imminent threat' grant from the Department of Housing and Urban Development to reconstruct nine bridges along Fall River. . . . Not only was the grant the only one approved in the region, but it marked the first time in several years that anyone has been successful nationwide in obtaining 'imminent threat' status.

Additionally, Kistner helped obtain $425,000 worth of property acquisitions through FEMA for flood damaged properties which were covered under the Federal Flood Insurance Program.

A brief recap of the major sources of funds for reconstruction and recovery projects follows:

- Share of Expenses:
  1) Federal--$1,517,845
  2) State of Colorado--$200,000
  3) Town of Estes Park--$305,948*
- Sources of Assistance:
  1) U.S. Housing and Urban Development (imminent threat grant to construct nine bridges)--$400,000
  2) Colorado Community Block Grant--$60,000
  3) Federal Emergency Management Agency (property acquisitions)--$425,000

An important consideration in the recovery period is the extent to which a community suffers major long-term effects as a result of the disaster losses. Thanks to the significant amount of federal monies that Estes Park received, it did not have to reallocate program funds, defer any planned capital improvement projects, or postpone any maintenance or repair work.

It should be pointed out that Kistner did not receive all of the external funding he applied for to aid the recovery. An application to the state for Community Development Block Grant monies for $400,000 to remove some properties in order to create a riverfront park was pared back to $60,000. Kistner commented that the town's conservative (i.e.,

*The town's share will exceed this amount, if the hydroelectric facilities are rebuilt. The damage to the town's light and power facilities was estimated at $1.3 million. If the proposed hydro project is approved and the damage cost based on the cost of the replacement facility, then the damages amount will increase substantially.

healthy) financial situation worked to its disadvantage in this instance.

The 90-day report issued by the Hazard Mitigation Team (HMT) made numerous recommendations about mitigative steps, which were intended to be instrumental in assuring that federal recovery efforts were comprehensive, well-coordinated, and directed toward reducing the potential for future flood losses in Estes Park. The report was far-reaching and specific. More than 20 recommendations were presented under four main headings. A summary of those implementation measures is contained in Appendix A.

Role of the Business Community

The business community sustained the greatest damage from the flood and, as might be expected, had a large role in the recovery process. The economy of this resort community is heavily dependent on retail sales during the summer months. The flood on July 15 was a serious setback to the local economy. Not only were many stores and motels closed because they were damaged, but tourism in the entire area was down significantly for the remainder of the summer because potential visitors were fearful. Many had exaggerated notions of the extent of the flood damage or of the potential for other dam breaks throughout Colorado.

A relatively new business group--the private, non-profit Forward Estes Park Foundation--was interested in promoting and developing the economic base of the Estes Park area. After the flood, the group quickly pressed for action on its long-term agenda for the town. At least one of the leaders in this business group remembered the impact of the 1976 flood on the local economy. In his opinion, the governmental response in 1976 was too "laissez-faire" in taking care of business interests. Consequently, the 1982 flood had a unifying effect on the

Foundation, providing it with the opportunity to press hard for the concerns of business owners.

Immediately after the flood, the foundation hired a consultant to represent their interests in various meetings with public officials, particularly the federal and local officials empowered to make decisions that would affect the business community. He was particularly instrumental in creating a local urban renewal agency. The foundation consultant discovered that under Colorado state law, special, more expeditious procedures existed for establishing an urban renewal authority in a community that has had a major disaster.

While the urban renewal agency already was an agenda item for the foundation, the circumstances after the flood were appropriate for the immediate creation of such an organization. The foundation played a major role in initiating and garnering support for an urban renewal agency in Estes Park immediately after the disaster. One of the officials of the foundation estimated that the disaster chopped years off the urban renewal formation process of creating a local urban renewal agency.

Role of the State

The role and responsibilities of the state regarding the Lawn Lake dam failure and flood are a complicated tale. Certain aspects are under scrutiny in litigation that is pending at the time of writing.

The 80-year old, privately owned Lawn Lake Dam had been cited for possible seepage problems in a state inspection conducted four years prior to the break; and it had been the subject of complaints for

years.* Aside from the questions about the frequency and effectiveness of the state inspections, questions persist over who is financially liable for the total flood losses, estimated at around $30 million, when the dam owner was insured for only $1.4 million, with liability limited by state law.

A variety of bills have been introduced into the Colorado State Legislature to allow Lawn Lake victims to sue the state. Because the dam was human-made, and because the state is viewed as deficient in its dam inspection duties, feelings run high that the state is to blame and that the state should pay for property damage. Similarly, several legal efforts are pending against the federal government--in part because the privately owned dam was within Rocky Mountain National Park. Meanwhile, many uninsured home and business owners who lost property due to the flood are attempting to find someone to sue for their financial losses.

After the flood, the state provided a single lump sum payment of $200,000 to the town of Estes Park for its share of the recovery effort.

Local-Federal Relations

Local-federal relations were exceptionally smooth, largely because the town's disaster recovery manager had been employed previously by the FEMA regional office in Denver. Town officials viewed relations with the federal officials as positive. Similarly, the federally initiated Hazard Mitigation Team report praised the efforts of the recovery manager. The disaster recovery manager was able to marshall a generous

*The dam had been cited for possible seepage problems in a state inspection conducted in 1979. In fact, "complaints about the dam's safety reached state officials as long ago as 1951," according to an article in the Rocky Mountain News (Denver, Colorado) on July 16, 1982. The Colorado State Legislature passed a law in 1981 which exempted the board of directors, employees and shareholders of any private irrigation company from personal injury resulting from the failure of a dam or other facility.

amount of federal assistance, as was detailed earlier, which contributed to a high rate of local satisfaction.

Mitigation Measures

The 90-day Hazard Mitigation Team report commented favorable on the high implementation rate for the mitigation activities recommended in the 15-day report. It stated:

> A wide range of federal expertise was combined with the cooperation of local and state governments from the outset. This mutual support and participation created an atmosphere of accomplishment that is reflected in the high implementation rate of the recommendations set forth in the 15-day report.

Further, the report noted that:

> . . . the Team was able to concentrate on the kinds of activities that carried an immediate payoff in reducing future flood losses.

The HMT report cited several major accomplishments:

1) The Estes Park recovery effort has enhanced the status of hazard mitigation in the State of Colorado, among diverse federal agencies. It has also advanced the procedures for mitigating the effects of a dam-failure event.

2) The flood . . . prompted numerous riverfront revitalization efforts that will strengthen the economic base of Estes Park while helping to protect the community from future flood disasters.

3) The local hiring of a Flood Recovery Expert fromthe ranks of the Hazard Mitigation Team will help to guarantee a lasting recovery. This is one of the more positive steps . . . and assures that the high level of cooperation between the town and the Team will be perpetuated.

Finally, the 180-day report was unusually complimentary, stating "Estes Park has been able to effect a quick and efficient recovery from the Lawn Lake failure and resulting flood." It claimed that was "due to the 'acnievable' nature of the recommendations and was greatly facilitated by the hiring of a local flood recovery expert."

Interviewers' Perceptions

This community provides an interesting and positive example of recovery. While significant credit is due to the disaster recovery manager, credit also should go to the town officials who created and supported that position high in the hierarchy of town government.

It is interesting to note that the reasons for hiring a disaster recovery manager were all locally determined. While there have been other local disaster recovery managers in the past (e.g., at Lake Elsinore, California; and Johnstown, Pennsylvania), those positions were initiated and paid for by the federal government--under EDA's Title IX. All parties in Estes Park stated such a person should be locally selected and a part of local government. As such she/he would be a stronger advocate of local interests and would not feel conflict when local, state, and federal interests differed.

Kistner's presence in Estes Park as part of the Hazard Mitigation Team and his availability for local employment were fortuitous events. It is interesting to ponder what might have happened if the town recognized the need for help, but no qualified person were on the scene.

Estes Park is a relatively well-to-do community and one that is well-managed in normal times, which are plusses in time of crisis. Bringing in a recovery expert to handle duties considered extraordinary was a wise decision, not only because it facilitated recovery but also because it enabled town officials to do their regular jobs.

Many of the persons interviewed said the town is better off than it was before the flood. Everyone lamented the death and destruction there was, but from the standpoint of a renewed central business district, a new urban renewal authority, removal of blighted and flood-prone structures, the town is better off.

Less positive predisaster conditions, such as lack of coordination among emergency coordinators in the five towns and the county, and lack of preparedness by the local Red Cross for a major disaster, did not prove to be critical problems, but they might have become so. Finally, it was just good luck that the dam broke in daylight hours, that an early warning was given, and that many lives were spared.

Attachment A

A SUMMARY OF IMPLEMENTATION

Recommendation		Lead Agency	90-Day Status
IDENTIFICATION AND REGULATION			
A1	Flood Insurance restudy	FEMA	Partially implemented
A2	Floodproofing guidance	FEMA	Fully implemented
A3	Bridge Standards	Local	Fully implemented
A4	Community Assistance (CAPE)	FEMA	Fully implemented
A5	Exchange dam information	FEMA	Fully implemented
A6	Dam failure inundation mapping	FEMA	Partially implemented
A7	Study Park Public use facilities	N.P.S.	To be accomplished
A8	Corps of Engineers (205)	Local	Not implemented
A9	Dam owners handbook	State	To be accomplished
MINIMIZING FLOOD RECURRENCE			
B1	Acquisition of impoundment rights	N.P.S.	Partially implemented
B2	Floodplain restructuring at hatchery	State/Local	Fully implemented
B3	Debris removal	FEMA	Fully implemented
B4	Park Debris removal	N.P.S.	Fully implemented
HAZARD WARNING AND EDUCATION			
C1	Flood warning system	FEMA, et.al.	Not implemented
C2	Lenders/agents seminars	FEMA	Fully implemented
C3	Disaster preparedness plans	Local	Partially implemented
STRUCTURAL/NONSTRUCTURAL MEASURES			
D1	HUD SCBG funding (threat)	Local	Fully implemented
D2	HUD SCBG funding (regular)	Local	Partially implemented
D3	1367 Program	FEMA	Fully implemented
D4	Mobile Home park relocation	Local	Fully implemented
D5	River Front development	Local/State	To be accomplished

Source: "Post Flood Recovery Progress Report; Lawn Lake Dam Failure and Fall River Flood," 90-day report, p. 9.

CHAPTER XVIII

SALT LAKE CITY, UTAH, AND ENVIRONS

Background

In a two-month period during the spring of 1983, the most severe and extensive snow melt in the history of the state of Utah occurred. All seven major creeks in the Wasatch Front reached flood stage. Two factors that contributed to the flooding were an abnormally cold, rainy, snowy winter and spring, as well as unusually warm weather during the end of April and early May. In early April weather had been unusually cold, with very little snow melt occurring. Then, in May, the temperature soared into the 90s before cold weather hit once again.*

The widespread flood and debris flow damage along the Wasatch Front struck the state's major population areas and damaged road systems and rail routes, homes and businesses, agricultural lands and public facilities. According to the Hazard Mitigation Plan,** damage and losses totaled almost $490 million. In the section of the Wasatch Front north of Salt Lake City, landslides and debris flows caused direct damage of more than $250 million.

Public officials and residents were prepared for flooding; however, neither scientists nor emergency managers anticipated the widespread landslides and debris flows after a sudden thaw in May of 1983. At least 92 significant landslides devastated a 30-mile length of the Wasatch Mountains, sending torrents of water and debris onto the

*A related hazard in Salt Lake County is the Great Salt Lake. The unusually heavy rainfall plus the snow melt in 1983 contributed heavily to the high inflow to the Great Salt Lake. In the late spring of 1983, the lake increased six million acre-feet in volume and 267 square miles in area. That was the greatest seasonal rise ever recorded. As of February 1, 1984, the lake stood at 4,206.3 feet above sea level, posing a continued threat to property and businesses on the shore.

**Prepared by the Utah Department of Public Safety in February, 1984.

residential areas below. Additionally, there were more than 1,000 landslides along the Wasatch Plateau. Still other massive landslides in Spanish Fort Canyon (in Utah County) created Thistle Lake, and in Twelve-Mile Canyon (Sanpete County), slides dammed a river and sent a 30-foot-high flash flood surging down the canyon. These floods, landslides and debris flows were so extensive that 22 of Utah's 28 counties were included in the Presidential Disaster Declaration. Three-quarters of the state's poulation came under this disaster declaration; about 80% of Utah's population lives along he base of the Wasatch Front. The Presidential Declaration was the first in Utah's history.

Salt Lake County, which includes Salt Lake City and 22 other municipalities, contains about 60% of Utah's population (about 1.5 million). Salt Lake City has a population of about 163,000. Salt Lake County was the most severely hit by the 1983 floods, sustaining over $20 million in damages and restoration costs.

During the peak runoff period in Salt Lake City, debris in the water flow contributed to the flooding by clogging conduits. As planned by local public officials, public property (mostly streets) in Salt Lake City bore the brunt of the physical damage caused by the flood. Public access to various parts of the city was disrupted seriously for almost one month as streets were used as drainage channels. Businesses also were disrupted throughout the city because of the use of major arterial roads as waterways. Nevertheless, physical damage to private property was kept to a minimum within Salt Lake City.

A total of 122 political subdivisions--cities, towns, and associations--were contained within the declared disaster counties. In this report, we will highlight Salt Lake City's unusual response activities and also the city of Farmington's (in Davis County)

substantial mitigation activities in the aftermath of the 1983 disasters.

From the standpoint of preparedness, city and county officials were fortunate in that the onset of the disaster was slow and carefully watched throughout the spring of 1983 by city, county, and state officials. Salt Lake City had an existing plan for a flood, and the plan was activated when the appropriate time came.

Response in Salt Lake County

The peak period of response activities in the Salt Lake County area was over the Memorial Day weekend in 1983. Salt Lake City planned to channel the run-off water down a predetermined set of streets in order to prevent disastrous damage to the structures in the downtown area. Essentially, they flooded public property to spare damage to private property. The first step, taken in mid-May of 1983, was to transform 1300 South Street, a major city arterial, into a "river" to receive the overflow from two major creeks. A combination of city staff, contractors, and volunteers transformed that normally busy street into a temporary flood control facility. The second transformation came a week or so later when the city officials made the decision to channel State Street, to avoid millions of dollars of flood damage in the downtown area. On a Sunday afternoon late in May, about 5,000 volunteers arrived to build the sandbag dike needed on State Street. Since the main transportation routes downtown were severed by the "State Street River," two temporary vehicular crossings and several pedestrian bridges were constructed across State Street to provide needed access to the downtown areas. The sandbag-edged dikes on South 13th and State Streets were needed for about ten days, after which time they were promptly removed.

The city's total operating costs were $8 million for a 30-day period. During that time, the city sustained $1.5 million in property damage, primarily to public property. No evacuation was necessary. The city officials estimate that if they had not used the streets as channels for a "planned run-off," damage to downtown commercial and residential property would have been about $100 million.

Local public officials took a calculated risk in using public roadways to avert damage to the downtown commercial and residential structures. They wanted to minimize the disruption to local commerce and decided the city would build, and later clean up, the needed dikes. The mayor and chief administrative officer of Salt Lake City met with the downtown merchants on two occasions to brief them about the plan for dealing with the run-off. Almost unanimous consent was achieved, but after the planned run-off, a few businesses filed suits against the city for business losses.

Local Preparedness

Salt Lake County has the lead responsibility for emergency management coordination. The Emergency Operating Center and operating procedures did not function as well as some city and county officials would have liked. Additional planning activities have been undertaken since the 1983 flooding to improve the county's emergency management capability and also city/county coordination.

In responding to the 1983 disaster, city and county personnel appear to have bypassed the emergency management office, with flood control and public works personnel assuming a major role in the flood-fighting activities. Throughout the spring of 1983, the hazards were kept visible by media coverage, and speeches by public officials at civic and service clubs. Citizen support for the flood mitigation and

preparedness measures was high; they wanted the county to hurry with its flood control efforts.

The city of Salt Lake maintains an unusually high awareness of meteorologic and hydrologic conditions affecting it. The city has a hydrologist on the staff, and also provides raw data about local conditions to the National Weather Service. In its efforts to control the city's reservoir and the watershed along the Wasatch Front, technical experts kept the city officials apprised of the situation developing in early 1983. The main determinant of the flooding was the melt pattern. Had there been the "right" melt pattern in 1983, there would have been relatively little flooding. When the city's ability to drain the rapid run-off from the snow melt in May proved to be inadequate, a local state of emergency was declared. About a week later, the county declared an emergency. The city-declared emergency was invoked before the actual emergency happened. The city used a military-style command and control system during the emergency response phase.

City-County Relations

Generally, the city's main responsibilities were flood fighting and flood management. City officials served as advocates for community interests with the county regarding repairs to damaged conduits. The county's responsibilities include the construction and maintenance of major structures and systems, which they maintain using revenues from a county-wide tax.

In May of 1983, Salt Lake City handled many preparedness and flood-fighting activities on its own. Other efforts, such as maintaining flood control structures and systems and construction projects were done by the county, in the County Flood Control and Water Quality Division. For the recovery, the county has the lead coordination role. For

example, most of the Damage Survey Reports (DSRs) are the county's responsibility. Also, the county is paying the local share of flood-related projects, e.g., utility repairs.

An unusual aspect of local public administration is that in counties in Utah, including Utah County and Davis County, citizens elect a surveyor. The surveyor oversees the public works and engineering projects. One of the disadvantages of this arrangement is that coordination between counties for public works projects is difficult to achieve. Salt Lake County has a Department of Public Works, which handles flood recovery matters separately from the elected surveyor. Consequently, Salt Lake County was able to achieve better coordination than Davis or Utah counties.

After the major disasters, the county commissioners in Salt Lake County 1) applied for federal assistance; 2) decided to prepare a bond issue; and 3) prepared to raise taxes. A $33 million bond issue was approved by the voters, about half of which was used for recovery projects during 1983.

The county flood control director thinks that in about one more year, the county may have accomplished all that is possible for flood control measures. Additional investment will be needed for infrastructure, however, to keep up with new development and alsoto replace aging infrastructure, such as storm drains. For many western communities, the replacement of old infrastructure is a new experience.

After the disaster, Salt Lake County decided not to wait for the federal assessment of damages. It immediately hired a team of private engineers to complete a report of public facilities and damages sustained. The county spent $300,000 on this report, which was published less than a month after the disaster declaration. The county wanted to be able to evaluate what a structure or system ought to be,

not what the FEMA standard would allow. Salt Lake County is spending about $22 million on flood recovery and mitigation projects, about $6 million of which came from FEMA. The county flood control director thinks the $300,000 expenditure for planning and baseline data for a $22 million expenditure is reasonable. He values the document for assisting with maintenance projects for the next 20 years.

The county is processing about 100 DSRs, which amount to about $6 million (including flood-fighting costs).

Local-State Relations

Among the state agencies involved in the disaster and its aftermath were the Utah Public Safety Department, National Guard, Comprehensive Emergency Management Office, Department of Transportation, Social Services, and Natural Resources. The governor appointed a task force, which met every two weeks during the spring of 1983 (from early March through May). It worked out lines of communication and areas of responsibility among state organizations.

While preparations had been underway for many months in early 1983, the state (and others) still were caught by surprise by the number and magnitude of hazards that occurred in late May. After the disaster, the state legislature appropriated $30 million to assist local agencies in their recovery efforts. A one-half cent sales tax was used for flood recovery projects. The legislators knew that there was great local need for income to cover the disaster-related expenses.

The Utah Disaster Relief Board was created by the Utah State Legislature in July of 1983 to specifically address the needs of local units of government. The governor and State Legislature recognized that the payment of an estimated $45 million in damage costs, even with a high level of federal participation, would impose severe hardships on the financial capabilities of impacted counties and municipalities.

Although the State of Utah itself faced financial difficulties, the Disaster Relief Act of 1983 was passed, and the Division of Community and Economic Development was directed to administer the act-associated programs.

Ten million dollars were authorized and appropriated to provide disaster relief. The Utah Permanent Community Impact Fund Board (CIB) was designated by the Disaster Relief Board (DRB) to administer the funds appropriated in the act. Administration included reviewing applications for disaster relief grants and granting disaster relief funds for localized disaster areas. The amount of each grant was to be determined by the DRB in consultation with state agencies familiar with relevant considerations to each application and within the limits set in the act. All grants must pass approval by the Utah Division of Comprehensive Emergency Management, which was represented on the Disaster Relief Board.

Eligible applicants were counties and municipalities lying within federal or state-declared disaster areas. The DRB was authorized to grant funds to eligible applicants to help repair, restore, reconstruct, or replace public facilities that were damaged or destroyed by flooding or mudslides. An eligible applicant would not be granted funds unless it or the county in which it lies first had levied a tax of at least 2 mills or 50% of the local FEMA match, whichever is less, and applied the proceeds toward the costs of the flood or flood recovery.

In March of 1984, the Disaster Relief Board reported on its projects and funds. Twenty-three counties received $3.4 million in 1983 FEMA match funds; and 46 non-FEMA projects were funded at a total cost of $18.4 million. Salt Lake County received the most funds in 1983: about $1 million in FEMA match funds and $6.2 million in non-FEMA projects.

In 1984, the governor requested an additional $38 million for the DRB from the State Legislature. The Legislature appropriated $20.8 million, of which $13.4 million was for unmet flood needs in municipalities in 1983.

Citizen Activities

There was high citizen interest throughout the spring, both before and after the disaster event, and tremendous citizen involvement in the flood-fighting activities. Even after the disaster, citizen interest in the reconstruction and mitigation projects remained high.

The city and county received a tremendous amount of help from volunteers in 1983--the number was said to total 40,000. For the most part, the volunteers were not systematically organized. The main mechanism used was contact with the leaders of the Church of Jesus Christ of Latter Day Saints (LDS).* In the past year, local public leaders have been working with local neighborhood groups to achieve a better system for organizing and supervising future volunteer efforts.

Some voluntary assistance has come from professional engineers. The American Society of Civil Engineers (ASCE) provided some voluntary assistance in 1983. Since then, a more structured, professional volunteer response is being planned.

Federal-Local Relations

When FEMA personnel and the Interagency Hazard Mitigation Team came into Salt Lake City two weeks after the declaration, there was little to see of the temporary measures. The HMT report notes that, fortunately,

*For members of the LDS church, taking care of yourself and your family is a part of the religion. Mormons typically keep foodstuff and other essential products in their homes in case of emergencies. Their philosophy and personal preparedness were very helpful during the major disasters. Plus, the great willingness to aid their neighbors and the community as a whole were of inestimable value to the city and county governments.

the city prepared a 30-minute videotape of the flood fighting and other preparedness and response efforts.

City officials had not had any experience with FEMA because they had never before had a disaster of a magnitude that warranted a Presidential Disaster Declaration. The city officials did not gear their operational plans around FEMA, i.e., anticipating the federal requirements and processes for reimbursement. If the city officials had known what expenses are allowable by FEMA, they would have put more emphasis on contract labor rather than on city staff resources. Since the disaster, they are beefing up their inventory of contractual relationships with suppliers and now have more emergency contracts in place for future use. The city officials rented a helicopter during the response period, an expense not allowable by FEMA. Nevertheless, local officials thought it was invaluable and would do it again.

Although local officials did not know what a Presidential Disaster Declaration meant before May of 1983, their experience with FEMA was positive. They appreciated the federal support and assistance. They also valued the advice about future events. After the disaster, county personnel complained that the frequent change of federal personnel, such as the Army Corps of Engineers representative, meant a lack of continuity for seeing recovery projects through to completion. Also, they said there were not enough FEMA personnel available. At that time, FEMA personnel from the Denver Regional Office were handling several disasters.

As is true in other communities, there was some argument over the DSRs, particularly project costs not allowable by FEMA. County officials said they tended to want to go the more expensive way in rebuilding.

From a financial standpoint, Salt Lake City started 1983 in the red; but it expects to have a $2 million surplus by the end of the year. A tax increase voted on after the disaster is the main reason for the expected surplus. The city told its citizens it had spent $10 million in the flood response and it needed a tax increase. The citizens approved the increase.

Response in Farmington

About 20 miles north of Salt Lake City, in the adjacent county of Davis, the small community of Farmington had some massive debris flows that devastated a residential cluster at the mouth of Rudd Canyon Creek. The debris flows that descended on Farmington on May 30 and 31 were the result of landslides on the steep slopes in the canyon above Farmington. In addition, according to the Hazard Mitigation Plan, ". . . a number of landslides shifted, . . . but did not mobilize to flow downslope to the canyon bottom. These partly detached landslides remain perched in metastable condition."

A postdisaster study, conducted by the U.S. Geological Survey with funding from FEMA, found that a series of debris flows during the spring of 1983 deposited approximately 80,000 cubic yards of debris over 19.3 acres at the mouth of Rudd Creek Canyon. The debris flows damaged 35 Farmington homes, 15 of them seriously. Estimated property damage was $3 million. The investigators also identified a large, partly detached land mass (estimated at 100,000 cubic yards) next to the existing scarp. This mass poses a potential threat to the same area given the prospect of continued heavy precipitation. In addition, the investigators identified hundreds of existing detached slides in a 60-mile study area.

The geological report suggested that Farmington City officials acquire 11 properties and construct a debris basin on the site of the expected slide. Since the estimated project cost of more than $1 million was beyond the financial capability of the small town, outside help was needed. One of the behind-the-scene actors was the disaster recovery manager employed by the state's Comprehensive Emergency Management Division. His role in coordinating a multi-jurisdictional effort and in assisting localities with grant-writing activities was not known until after the field investigation was completed.

Prior to the 1983 debris flow, the city had received a CDBG grant to construct a fire station. Local officials asked the state Department of Community and Economic Development to reprogram that grant to provide for property acquisition necessary to construct the debris basin. This was done. Also, the state approved an additional $200,000 for Farmington from the CDBG Jobs Bill. In addition, the Utah Disaster Relief Board provided $595,000 to Farmington for the project. The city contributed a public lot within the debris basin valued at $20,000.

Further mitigation efforts in Farmington include a system for monitoring earth movements at selected sites and preparation of land use measures for local enactment; that system was supported by a Disaster Review Board grant of $40,000 to the state university. One such measure is a mud flow ordinance that would require developers to obtain soil and engineering reports and topographic maps identifying existing conditions on project sites in mud flow areas.

For the small community of Farmington, the extensive damages required prompt and expensive mitigation steps. Living beneath a partially detached land mass raises serious concerns. The small town was forced into a significant set of public works and improvements. Nevertheless, the city manager was able to direct the many activities in

a prompt and effective manner, using county, state, and federal assistance.

Interviewers' Perceptions

Salt Lake City engaged in extensive preparedness measures and in a dramatic response to the snow melt and flooding in 1983. Recovery activities were minimal in Salt Lake City, since the county has responsibility for most of the flood protection infrastructure.

The nearby community of Farmington provides an interesting contrast. Since it was not able to anticipate the massive land and mudslides it sustained, Farmington was faced with many recovery decisions. The city encountered many immediate pressures to take mitigative actions and it did so during the recovery period.

The weakness in emergency management capability and the lack of city/county coordination in the Salt Lake City area appear to be problems, although they were circumvented this time. In 1983, ad hoc response and recovery actions were sufficient, but it appeared that more permanent organizational arrangements would be needed for the anticipated run-off in spring of 1984 and in subsequent years.

The active mitigation efforts of the many municipalities affected in 1983 paid off in 1984. In late spring of 1984, a repeat disaster was averted thanks to structural and nonstructural actions, weather (gradual snow melt), and luck.

After reviewing this report, the county flood control director advised us that the City and County of Salt Lake had developed a closer coordination mechanism in the past year and that the 1984 flood fight went much more smoothly. "The organizational arrangements we made have been established on a permanent basis and they have provided the strength that your report suggests they would."

CHAPTER XIX

COALINGA, CALIFORNIA

Background

Coalinga is a small, rural community (population about 7,000) located in southwestern Fresno County in the western part of the San Joaquin Valley. Fresno, the county seat, is 65 miles away. The community served as a railroad coaling station, hence its name, Coaling (Station) A. Later, the city was the center for oil exploration in the area. More recently, construction of the California Water Project (a major irrigation project in the state) has contributed directly to the expansion of agricultural activity into the west side of the valley and indirectly to Coalinga as a commercial center.

On May 2, 1983, an earthquake measuring 6.7 on the Richter scale hit about 9.5 miles northeast of the city of Coalinga, causing damage in a 25-mile radius. According to the expert team of the Earthquake Engineering Research Institute, no foreshocks greater than 1.5 had been observed on University of California seismographs. The May 2 earthquake had a mean Richter magnitude of 6.7 and a maximum Modified Mercali intensity of VIII. The two largest aftershocks were 3 minutes (M_L 5.6) and 80 days (M_L 6.0) later. Although the main earthquake was of only moderate magnitude, ground motion was perceptible 200 miles to the north and south, in San Francisco and Los Angeles. The May 2 earthquake and its aftershocks were in the eastern Diablo Range, about 18.5 miles northeast of the San Andreas Fault. The location and nature of this fault caught even local geologists by surprise.

In seconds, the earthquake of May 2 devastated Coalinga's central business district. Coalinga was the only community to suffer serious damage from the earthquake. While there were no deaths, 47 people were

injured. Nearly 2,000 homes and about 200 businesses were damaged. The central business district suffered almost total devastation because it contained many unreinfoced masonry buildings. The downtown streets were impassable, water mains were broken, telephone service was disrupted, communications towers collapsed, the city's gas distribution and electric systems were shut off, and sewer lines collapsed. The total damage was estimated at $31 million, including almost $6 million damage to local public facilities.

Coalinga is relatively isolated; the nearest town is 17 miles away, and the nearest large city is 50 miles away, in another county. Since the effects of the earthquake were felt mainly in Coalinga, no other city had need of emergency resources. Neighboring communities and the Fresno County government quickly marshalled their resources to help Coalinga. Further, the highways that lead to Coalinga were not seriously damaged, so land transportation was not disrupted. Other local ambulance services and fire departments assisted the city. The County Sheriff's Department set up a command post in Coalinga within an hour of hearing about the earthquake.

Coalinga's local economy comprises oil drilling and related services (about 50%), agriculture (about 30%) and retail sales and services (about 20%). All three sectors sustained damage. This diversified economic base, while growing relatively slowly, is steady. At the time of the quake, the city had a small surplus of funds, due mainly to utilities income. In addition to providing the usual municipal services, the city also provides gas, water and sewer services to its homes and businesses.

Local Response

The sudden onset of the earthquake and the lack of local preparedness resulted in many problems. Several of the major problems

in the aftermath of the May 2 earthquake are documented in a report to the California Seismic Safety Commission, published about one month after the disaster:

1) Although Coalinga had an emergency plan, the plan was considered impractical and not followed. . . . Lack of a practical emergency plan, and prior exercise of that plan, precluded optimum emergency response.

2) A second, extremely serious problem was the lack of adequate communications. Telephones generally were inoperative and the city repeater on a nearby hill stopped functioning. City radio communications became limited to vehicle-to-vehicle, although some use was made of CB radios. Fire units could talk to other fire units on a limited basis and law enforcement . . . could talk to law enforcement . . . on a limited basis, but there was absolutely no communiciations system Direction and Control could use to effectively coordinate the use of the available resources. . . .

3) There were no previously designated alternate Emergency Operation Center (EOC) sites. After the decision was made that neither the fire station nor the police station could be used as an EOC, considerable confusion existed as to what to do. Approximately two hours after the initial shock, the California Highway Patrol office was selected to be the EOC and Command Post.

4) The news media was [sic] an extremely disruptive influence. they frequently hindered response actions in their efforts to obtain camera coverage or to interview rescue workers, city officials, or other response officials.

5) Once the decision was made to turn off the natural gas system, the people designated to take the action could not identify which valves to turn to complete the shut-off. When the gas was finally turned off, all electrical power generated through natural gas was lost.

6) A major problem was the influx of people into Coalinga (primarily news media, well-intentioned information seekers, and curious sightseers). This took considerable effort to control and actually impeded recovery efforts.

7) Since the majority of buildings in the downtown area were considered unsafe, it became a serious problem to keep the businessmen from entering the area while reassuring them that their property was under 24-hour security and that they would be allowed entry at a later time.

Adding to the local response difficulties was the fact that while the City Hall building was intact, the interior furnishings had been tossed about. Many officers were unusable until the contents of book shelves, cabinets, and desks could be cleared from workspace. The Emergency Operating Center finally was established at the California Highway Patrol (CHP) office at the edge of the city, after two earlier choices were ruled out. At the CHP building, access and communications remained intact.

Local officials, reviewing this list of problems about one year after the disaster, view things differently. First, the locality had an emergency plan, prepared in accordance with state guidelines, but it was not practical (and hence not used) for the disaster. Second, local officials did not see the communications breakdown as the "extremely serious problem" noted. One person half-jokingly said, "When the telephone lines went down it was almost a relief." Third, since the town was small, and most agency heads knew what resources they had, they effectively used the resources they had. Similarly, a "quick look around" enabled local leaders to decide on an alternate location for an EOC. In fact, there were several EOCs--the CHP building was headquarters for the city manager, sheriff, fire chief and the CHP. Public Works operated out of City Hall, the county used the Elks Lodge, the Red Cross used the college. Fourth, the local officials did not remember the news media being as discruptive (except at the local hospital) or the influx of curiosity seekers as bothersome as the observers did--thanks to check points on the few roadways into Coalinga. Finally, the perimeter of the badly damaged downtown area was controlled at first by the County Sheriff's Department and later by local officials using rent-a-fence and rent-a-cop. The latter arrangement worked extremely well in the opinion of local officials.

After the quake, the city expected a loss of revenue, but it did not happen. The downtown businesses, which had borne the brunt of the structural damage, had provided only about 12% of the city's sales tax revenues. Because of the great increase in construction-related activities, including contractors seeking local licenses and purchasing building materials locally, revenues increased in the second half of 1983. Overall, municipal revenues were up about 16% over those of the previous year. While funds from federal and state programs have been coming in slowly, the surplus in the city treasury prior to the May 2nd earthquake eased the usual cash flow problem in the aftermath of a disaster. At least in the short-term, the city's budget is not seriously out of balance.

Recovery Activities

After the May 2nd earthquake, government officials at all levels except local questioned whether the city could and should rebuild. Such indecisiveness about the recovery process did not arise in any of the other case studies. Major uncertainties about existing land uses in an area of high seismic activity are at the root of this indecisiveness. There may be similar uncertainties in connection with other natural hazards, but no parallel has been observed thus far. Among their concerns were 1) the many severe aftershocks; 2) the dearth of insurance coverage on most of the severely damaged structures, private as well as public; and 3) anticipation of a large amount of indebtedness of both home and business owners. Local officials claim they never considered any option other than how to get back to normal as quickly as possible. As weeks went by, local officials and citizens were discouraged by the lack of federal assistance for recovery (especially for small businesses).

Many researchers and other observers who visited Coalinga shortly after the earthquake were initially pessimistic about the community's recovery, "but not the local politicians and bureaucrats," according to local public leaders who reviewed this report about one year later. Nevertheless, this research team observed in March of 1984 that Coalinga was not in danger of becoming a ghost town, although it was in danger of losing its businesses to a location outside of the central downtown area.

In Coalinga, the number of buildings damaged, as compared with the total, was high. Of the approximately $31 million estimated total damages sustained, about one-fifth were damages to local public facilities. Through FEMA's public assistance program, monies were made available (on a 75% federal/25% local match basis) to aid the city in the repair and reconstruction of public facilities. Yet, in actual fact the local share amounts to more than 25%. The remaining $25 million in damage was mostly to structures and property not covered by insurance.

The question of insurance coverage seems to have been seriously underestimated in the early months after the disaster. Payments by insurance companies had reached about $11-12 million dollars about 14 months after the disaster. That amount had added significantly to local property owners' ability to recover. One should keep in mind that Coalinga had a total city budget of $4.5 million the year before the earthquake. Therefore, the $31 million damage estimate equals more than half a decade of municipal income.

The almost total loss of the older, unreinforced masonry structures located in the downtown area has been viewed as "instant mitigation." That is to say, most of the structures that could not withstand the shaking from an earthquake showed obvious structural failure. Essentially, the earthquake singled out the older, vulnerable structures

and destroyed them. As a consequence, there were few decisions about reconstruction and possible retrofitting. After the earthquake, the structures standing were the ones most earthquake-resistant; they had been built in conformance with the more recent building code.

According to the California Seismic Safety Commission, about two weeks after the main earthquake the city had: "1) enclosed the damaged area with a chain link fence, 2) begun demolition plans, 3) initiated contract negotiations for demolion, 4) reviewed a design for development of the central business district, 5) initiated negotiations for redevelopment financing with state and federal sources, and 6) decided to incorporate all of its special districts into the redevelopment planning process." The city is using its Regional Plan (General Plan) adopted in 1972 as the basis for land use planning in the redevelopment process and has developed a plan for the reconstruction of the central business district. Among the changes in that plan made after the disaster were the provision of more area for multi-family housing.

At the local level, recovery planning has been led by 1) the city manager (who is also the city engineer); 2) the city's public works director, who as the official responsible for the municipal infrastructure and the utilities handled the DSRs and the effort to restore the utilities; 3) the City Council members, primarily in their roles as directors of the City Council and of the Redevelopment Authority, and 4) the Coalinga Industrial Development Council (CIDC) and Chamber of Commerce, which are spearheading the business sector recovery.

In addition, FEMA and the California Office of Emergency Services brought together federal and state agency officials to meet with city and county officials, social service agency representatives, and

developers. At the federal level, FEMA and SBA officials were key actors in the recovery planning process.

Prior to the disaster, the city had a Redevelopment Authority in place. At that time, the agency had a limited mission, that of focusing on three specific sites for redevelopment in the city. After the disaster, the decision was made--after local consultation with county and district officials--to expand the boundaries of the redevelopment area to cover virtually the entire city and to use the agency to lead the reconstruction and recovery efforts. The advantages of using the redevelopment agency include 1) its powers of emminent domain, 2) its ability to use tax increment financing for construction projects, 3) its usefulness as a vehicle for coordinating the redevelopment, and 4) its appropriateness for receiving federal grant money. With tax increment financing, property tax revenues on any assessed value above that on May 4, 1983, may be used by the redevelopment agency. This mechanism means the county will receive less income, but Fresno County agreed to allow Coalinga to use this mechanism to aid its recovery.

In the postdisaster period, a development and building policy was established by the City Council at the recommendation of the Planning Commission. The buildings that are going up since the earthquake adhere to those new building standards. Occasionally, variances are allowed, such as a waiver for setback.

The sector of the local economy that sustained the most destruction was the retail business community. The merchants located in the nearly totally destroyed central business district were provided with space at the local college gym for a flea-market type operation during the summer months. By fall, when the school term was to begin, the local Chamber of Commerce had managed to raise funds to acquire trailers, which were

rented out at reasonable rates to business owners. The trailers were parked on lots in the central business district.

City and county officials prepared grant applications to several federal agencies for assistance with business relocation. About $900,000 were secured from the Economic Development Administration (EDA) of the Department of Commerce. The EDA support included about $600,000 for the two commercial buildings; about $200,000 for a revolving loan fund; and about $50,000 for technical assistance. The latter was to be used for technical assistance and a consultant was hired to provide it.

In the two EDA-supported commercial buildings that are planned for the downtown area, rental space will be offered at reasonable rates to merchants who were operating prior to the disaster. Estimated completion date of the buildings is fall of 1984, which will mean about 1.5 years of business disruption for many Coalinga merchants.

One problem that occurred periodically was that the press and groups of citizens assumed that it was the responsibility of the city to rebuild everything as it was. The municipal officials were, in fact, quite limited in what they could do for the local merchants. Indeed, because local merchants paid as little as $.07 to $.20 per square foot for commercial space prior to the disaster, finding new locations that were affordable was a difficult task. Very few federal or state programs exist that could assist with the restoration of wrecked commercial enterprises. Many merchants suffered from more than structural losses; some lost furnishings, inventory, and even essential records (such as accounts payable).

Ironically, Coalinga's geographic isolation works in its favor in that patronage of local businesses continued--even through the disruptions--because alternative shopping locations are many miles away.

Role of Business Community

The Coalinga Industrial development Corporation (CIDC), a non-profit organization dedicated to business and industrial development, emerged to coordinate the private sector's interests in rebuilding the central business district. After a change in leadership (the former president was named to the City Council) and an expansion of its board from 9 to 15 members, the CIDC assumed an active role in promoting business interests during the recovery. The CIDC formed three commitees: Business and Industry Attractions, Long-Term Recovery, and Short-Term Recovery. The CIDC also conducted a survey of local needs and a community audit. The CIDC provides a public forum to review design concepts for reconstruction projects.

During the recovery period, two different business philosophies were expressed: one group wants businesses restored to the way they were and wants no or slow growth; a second group sees the disaster as an opportunity to rebuild in a way that will allow for infrastructure extension, business growth, and the attraction of shoppers to Coalinga from surrounding areas. Commercial restoration planning is complicated by the fact that a population of about 7,000 does not provide the "critical mass" necessary to sustain many businesses. Also, as is true in many other cities, businesses are locating in shopping centers outside of the center city.

With assistance from the Fresno County Community Development Department and the State Economic and Business Development Office, the city applied to the federal Economic Development Administration (EDA) for assistance in rebuilding the commercial structures. The CIDC also was involved in the city's grant application.

Local accounts and perceptions vary about why local business relocation plans went from a quick, temporary means of providing

commercial space to the permanent, substantial structures subsidized by the EDA grant for which the bid was accepted in March of 1984. The permanent buildings agreed upon are expected to make space available to existing businesses in the fall of 1984, for a rental cost of 20 cents per square foot--but with a rapid escalation of 35% a year--as compared to the 65 cents per square foot cost in private buildings in Coalinga.

Private Sector (Professional)

According to post-action reports provided to the California Seismic Safety Commission, ". . . the mobilization of the volunteer forces was faster and more complete than expected. This was the result of 13 years of work by the Structural Engineers' Association of California, and two years of assistance and coordination by the Seismic Safety Commission's Task Force on Earthquake Preparedness." Local officials cite the Red Cross, Salvation Army, a locally formed Christian Response Group, and private business donors for prompt, voluntary assistance. In addition, much-needed plumbers (100 of them from throughout the valley) volunteered. Additional valuable assistance came from the California Conservation Corps and the Mennonites.

Another important source of assistance was the Pacific Gas and Electric Company (PG&E). Although the city owns the gas utility company within the city limits, PG&E assisted the city (in part under contract and in part voluntarily) in testing all of the gas mains and in restoring service to local homes and businesses. The utility company was very supportive of local recovery efforts.

Other serendipitous offers of help were made to the city. An aerial photography firm offered to take aerial photos needed by the Public Works Department. Ultimately, the company donated services worth about $20,000 to the city. In addition, major oil companies with local commercial interests donated money to the city. Texaco, for example,

contributed $10,000. Chevron helped purchase a new ambulance, and Getty helped purchase a new communications system. Much of the cash went to the Red Cross and Salvation Army for disbursement.

City-County Relations

The earthquake shows the importance of the county government in the immediate response phase. Given the magnitude of the earthquake and the extent of the damage, the small city was overwhelmed. The county provided almost immediate police and other public safety assistance (such as sanitation and health inspectors). Also, two members of the County Board of Supervisors went to Coalinga to see first-hand what was needed, a gesture appreciated by Coalinga officials and residents. When special needs arose, such as for gargabe crews to collect debris, other cities in the area provided the city with the requested support. The county and the state provided road clearance equipment. Additionally, the county provided inspection teams; sheriff's inspections was one of the city's greatest needs.

While Coalinga had had some experience with FEMA (after a flood disaster declaration in the spring), and some experience with federal grant writing (with EPA for a new sewage treatment plant), the city officials were not prepared for dealing with a federally declared disaster and the attendant grant writing for a large-scale event. Fresno County assisted the small city in many ways. One of the most notable county actions was the allocation of a disproportionate share of existing program monies, such as CDBG and Housing Assistance and Renabilitation, for Coalinga. In the recovery planning process,the county, the state economic development agency, and consultants working with the city and county helped identify all possible sources of federal aid the city might pursue to aid its recovery. Regarding the identification task, FEMA had been a big help to the city.

The county assistance was gratefully acknowledged by the city officials. Before the earthquake, many Coalinga residents had long been dissatisfied with Fresno County government; an effort had been made some years ago to secede from Fresno County and form another county. Despite the distance, the city got prompt and generous assistance from the county during the response and recovery phase. City-county relations are probably at an all-time high since the earthquake.

City-State Relations

Disaster response assistance was provided by the California Office of Emergency Services, Highway Patrol, National Guard (paid for by the Red Cross), the California Transportation Department, Emergency Medical Services Authority, and California Conservation Corps. The Office of Emergency Services (OES), together with FEMA, coordinated all social service, lending, and regulatory agencies into a one-stop shop, which was helpful to local officials.

While Coalinga did not have the benefit of a federal interagency hazard mitigation team, it did receive some advice and assistance from the California Seismic Safety Commission. A SCEPP Assessment Team visited Coalinga shortly after the earthquake and prepared a Team Report. It is interesting to note their preliminary assessments of the recovery process at that time:

1) The emergency response and recovery operations in this earthquake have limited application to catastrophic earthquake events as projected for Southern California.

2) This event brought out the significant role played by the county government in the immediate emergency response and recovery phases of major earthquakes. . . .

3) Pre-earthquake planning, plan testing and personnel training are critical for effective response and short-term recovery.

4) The private sector throughout the county and state responded with great generosity to the situation.

5) Coalinga is taking advantage of all its existing plans to speed up the short-term and long-term recovery.

6) The recovery process in Coalinga is likely to be prolonged because of the lack of insurance coverage and the resulting dependence on federal disaster assistance programs.

7) Initial observations point to the city's need for technical assistance in both the development of a reconstruction and reinvestment plan, using state and federal aid, and in managing the actual reconstruction process.

City-Federal Relations

The city was not prepared for either a major earthquake or the massive infusion of help and resources needed during the response and recovery phases. The city, assisted by county and state agencies, prepared an application for a Presidential Disaster Declaration; the county itself later filed for a declaration. FEMA and OES took the lead in obtaining federal assistance for response and recovery activities. County staff helped prepared economic assistance and other grant applications. The city's public works director handled all DSRs for the city.

Shortly after the Presidential Disaster Declaration was received, representatives of federal agencies convened in Coalinga and described the recovery programs available to aid the city. By all local accounts, the promises were extravagant and the ability to deliver limited. This session caused a lot of hard feelings in the ensuing months. A major frustration experienced by local citizens was that while displaced residents could get rent-free trailers, displaced businesses were not eligible for any temporary relocation or rebuilding assistance. Individual businesses were eligible for SBA loans, but no assistance was available for dealing with aggregate business planning or relocation.

Among the federal programs considered for business-related relocation were UDAG, EDA, and Farmers Home Administration. Given the

local preferences, as well as federal program availability, EDA programs provided the most assistance. SBA was the single biggest program.

Local officials remain disgruntled about the lack of delivery by federal agencies and by the limitations of a Presidential Disaster Declaration. The mayor expressed his frustrations in testimony to a U.S. Congress committee, as follows:

> The promises fizzled, a few sputtered away but they still went out. Hopes were extinguished. FEMA assistance has never been clear. We believe that it is as follows:
>
> To provide mobile homes, but not the sites for them.
>
> To provide funds to render the devastated area safe, but not to put back together.
>
> To provide assistance in bringing in other federal agencies to assist.
>
> We do not believe this is enough, and we would doubt any Legislator or private citizen would believe that this is what is meant by a Presidential Declaration of a disaster.

Interviewers' Perceptions

In Coalinga, the citizens have a conservative philosophy about government and they are extremely independent and self-sufficient--probably because of the relative isolation of the city. Initially, they did not expect assistance from any level of government. In fact, they were reluctant, if not resistant, to accept individual assistance. Special efforts were made to get individuals who were eligible to apply for SBA loans.

Fortunately for the small city, the county was highly supportive in terms of providing emergency services and money from existing program funds (CDBG, home rehabilitation monies). Nevertheless, the extent of damages, the very limited amount of insurance payments, and the relatively limited external resources are among the reasons the recovery is slow in Coalinga.

From the standpoint of physical appearance and infrastructure, Coalinga is better off after the earthquake. The older, unstable, deterioriating structures are gone; the gas system has been carefully checked and brought up to current standards; some additional water and sewer capacity has been put into place, allowing a needed trailer park and providing possible expansion capability to city infrastructure; and, finally, the central business district will be modernized and revitalized.

On the other hand, there will be a high level of indebtedness of both homeowners and business owners for many years to come. The fact that so few losses were covered by insurance means that most of the cost will fall directly on the individuals stricken by the disaster. There remains plenty of emotional devastation as well. About 30 people move out of Coalinga each month (up from an average of 20), even though the total population is increasing.

Earthquake damage is different; it is more difficult and expensive to deal with in that structural damage from a quake may be subtle. After an earthquake, it is necessary to have an engineer doing building inspections to certify occupancy. In Coalinga, the public works director was the only municipal employee qualified to do building inspections--obviously not a good use of his time in the aftermath of an earthquake. The county provided the additional assistance needed.

APPENDIX A

YEAR III CASE STUDIES
FIELD REPORT OUTLINE

I. Background *

A. Description of the disaster

1. Type of disaster agent (e.g., hurricane or tornado)

2. Nature of impact (e.g., high winds, water damage)

3. Extent of damage

a) magnitude of event

(1) 100-year flood, hurricane-of-the century, or "average American disaster"

[leading to ad hoc or special organizational response vs. ready accommodation]**

(2) as percentage of physical stock and population

b) impact on each major sector of locality (residential, commercial/industrial, public property, farmland or open space, etc.)

c) extent of damage to private property and to public facilities

[leading to availability of public assistance vs. greater difficulty and more diffused process of obtaining funding assistance for private homes or businesses]

d) relative impact of event on community as a whole

4. Immediate response

a) public sector response (all levels of government)
b) general public
c) business community
d) others

5. Local preparedness plan: If plan existed at time of disaster, obtain a copy. Ask about whether plan was used during the disaster, to what extent, and how satisfactory it was.

---

* Include maps and other graphics, as appropriate.
** Guidance for field interviewers on topics to probe is enclosed in brackets.

6. Size of city and resources available

   a) professional, in-house personnel

   b) local public resources

      (1) financial and material
      (2) existence of and use of community development or economic development plan
      (3) application of resources to disaster recovery vis-a-vis local public financial capability
      (4) to meet recovery costs in impacted area, what trade-offs, reallocation or diversions of resources were made?

   c) local private resources

   d) other resources (e.g., military base)

B. Historical context

   1. Recent and older disasters from same disaster agent (e.g., flood history and hurricane record)

   2. Public and private leaders' memory of disaster recovery experience

      o present and previous local/state/federal relationship

   [probe regarding past experience and prior attitudes about mitigation]

II. Recovery Activities

A. Ask about transition from response to recovery phase: change in functions, change in actors, etc.

B. Array of recovery issues and problems arising during the aftermath

1. In the shorter-term (patch-up, repair)

2. In the longer-term (reconstruction, betterment projects)

C. Local public priorities (as derived from (B) above)

[probe for details of local decisionmaking regarding priorities; compare and contract local priorities with those of Federal Hazard Mitigaiton Team.]

D. Role of business community; public/private interaction

E. Local business/industrial community priorities

F. Functions and activiteis dealing with priority issues and problems. For each item listed, provide details on:

1. Who was involved?
2. What did they do?
3. When did they do it?
4. Why did they do it?

Cover all appropriate actors--at each governmental level and in private sector (business and citizen groups)

5. With what monies did they do it?

-- federal -- local
-- state -- private

6. With what other resources/assistance did they do it?

-- federal -- local
-- state -- private

7. Description of grants applied for or used

[leading to grantsmanship skill]

8. Issues regarding local authorities, powers, enabling legislation; home rule, charter considerations

[pursue with state and federal interviewees]

III. Mitigation Measures

A. In the shorter-term (e.g., floodproofing and sea walls)

B. In the longer-term

1. Major structural measures (e.g., dams and bridges)

2. Major nonstructural measures (relocation of a neighborhood)

3. Community betterment projects

[leading to how deep and far-reaching is the commitment to mitigation]

C. A written plan

[Is mitigation included in local emergency management plan? Is mitigation planning a noticeable activity in fact, if not in writing, at the local level?]

IV. Interviewer's Perceptions

A. Of the local public posture (i.e., attitude and actions) on recovery process in terms of:

1. Local emergency planning and management capability

2. Local public capacity (personnel and dollars)

3. Commitment to long-term mitigation measures, particularly measures requiring substantial changes

B. Need for, emergence of, and role assumed by ad hoc groups

THE
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APPENDIX B

March 1984

The Program of Policy Studies in Science and Technology at the George Washington University needs your help!

The Program is conducting a major nationwide study of community recovery from natural disasters. The purpose of the study, which is funded by the National Science Foundation, is to examine local public planning and management decisionmaking during the disaster recovery process.

Please take a moment to complete this brief questionnaire. Be assured that all of your comments will be held in strict confidence and that your participation is vital to the success of the project.

For the purposes of this study, a community is said to have recovered from a natural disaster when all of its political, economic, and social systems are functioning at least as well as they did before the disaster event. Please keep this definition in mind as you answer the questions on the following pages.

Thank you.

Claire B. Rubin

Claire B. Rubin
Director
Natural Disaster Research Center

We are interested in learning more about your recovery priorities following the May 1983 earthquake. We are especially interested in the period when most of the immediate human needs had been met and the town began to consider long-term recovery issues. To help us understand your priorities during that period, imagine that the total amount of disaster assistance available from all sources was $100. Indicate how you personally would have allocated that assistance to each of the "domains" listed below. (Of course, your allocations may or may not differ from the actual distribution of recovery assistance.)

Allocation	Domain*
_$_____	RESIDENTIAL, including the repair or reconstruction of houses, the repair or replacement of home furnishings, cars and trucks; the settling of insurance claims for damage to personal property; and the permanent resettling of displaced residents.
_$_____	BUSINESS, including the repair or reconstruction of economically viable commercial, industrial, and retail establishments; and the return of retail sales, business-related tax revenues, and employment to predisaster levels.
_$_____	PUBLIC SERVICES AND FACILITIES, including the resumption of water, sewer, electric, telephone and other basic services, the restoration of public transportation, parks, and recreational areas; the repair or reconstruction of public sidewalks, schools, libraries, hospitals, clinics, police stations, fire houses, and other municipal buildings; and progress on community projects that were planned or under construction prior to the disaster.
_$_____	GENERAL POPULATION, including the return of certain social indicators (such as birth, death, and crime rates; alcoholism, child and spouse abuse; and also welfare payments) to at least predisaster levels; and the implementation of other programs designed to restore or improve the quality-of-life for local residents.
_$_____	MITIGATION, including measures which will reduce future losses such as the preparation or revision of a disaster plan; the construction of levees, dikes, breakwaters, and rip rap; the implementation of projects such as the relocation of persons living in high-risk areas; the purchase of disaster-related insurance; and the passage of land use ordinances and building codes.
$100	Total disaster assistance available from all sources.

* The items describing each domain are illustrative rather than exhaustive.

We now would like to know how satisfied you are with the outcome of the recovery activities that followed the earthquake. Question 1 addresses your general or overall level of satisfaction, while the remaining questions focus on the five "domains" described above. Please note that all of these questions ask about the results of activities, rather than the performance of particular agencies or individuals. Feel free to refer to the description of the domains when answering questions 2, 3, 4, 5, and 6.

1. As of today, how satisfied are you personally with the overall outcome of the recovery activities that followed the earthquake. Would you say you are:

    1. Very satisfied
    2. Somewhat satisfied
    3. Somewhat dissatisfied, or
    4. Very dissatisfied

2. How satisfied are you personally with the outcome of the recovery activities that were directed primarily at the RESIDENTIAL domain? Would you say you were:

    1. Very satisfied
    2. Somewhat satisfied
    3. Somewhat dissatisfied, or
    4. Very dissatisfied

3. How satisfied are you personally with the outcome of the recovery activities that were directed primarily at the BUSINESS domain? Would you say you are:

    1. Very satisfied
    2. Somewhat satisfied
    3. Somewhat dissatisfied, or
    4. Very dissatisfied

4. How satisfied are you personally with the outcome of the recovery activities that were directed primarily at the PUBLIC SERVICES AND FACILITIES domain? Would you say you are:

    1. Very satisfied
    2. Somewhat satisfied
    3. Somewhat dissatisfied, or
    4. Very dissatisfied

5. How satisfied are you personally with the outcome of the recovery activities that were directed primarily at the GENERAL POPULATION domain? Would you say you are:

    1. Very satisfied
    2. Somewhat satisfied
    3. Somewhat dissatisfied, or
    4. Very dissatisfied

6. How satisfied are you personally with the outcome of the recovery activities that were directed primarily at the MITIGATION domain? Would you say you are:

   1. Very satisfied
   2. Somewhat satisfied
   3. Somewhat dissatisfied
   4. Very dissatisfied

Thank you for answering our questions.
We appreciate your willingness to participate in
this important research.