SEISMIC SAFETY POLICY IN CALIFORNIA:
LOCAL GOVERNMENTS AND EARTHQUAKES

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PREFACE

The original impetus for this research came from a report by the National Academy of Science on Earthquake Prediction and Public Policy. That 1975 report aroused our interest in earthquakes as events that might produce severe challenges for government. As with other natural hazards, government must bear a responsibility to help mitigate and respond to earthquake induced damage. In a matter of seconds, earthquakes can cause destruction of tremendous magnitude.

The problems resulting from earthquakes are usually only potential ones because major seismic events do not take place with any regularity; nor do they occur within the time frame of normal governmental budgetary cycles. No one can predict the exact time, place, and magnitude of an earthquake, but the certainty that a major earthquake will eventually occur on specific faults presents a constant threat of widespread death and damage. Trying to understand how government responds to that certain but unpredictable (as yet) threat was the motivation for this investigation of seismic safety policy in California.

This research was conducted between 1977 and 1980. Our report, therefore, is current through 1980. We realize that subsequent to 1980 a few of our research communities have taken additional action on seismic safety. We feel confident, however, that none of the policy changes undermines the basic findings of this report. But the reader should be aware that some specific facts may have changed slightly since we gathered our data.

Many people deserve our appreciation for their help in the preparation of this report. First and foremost is William Anderson, who as our project director at the National Science Foundation was very supportive, helpful, and patient. We were fortunate to have the assistance of four excellent graduate students: Henry Flores, Arthur Svenson, George Dennis, and Tom Andres. They prepared background reports on each of the research jurisdictions and they also helped conduct interviews. Without the services of our project secretary, Gail Clark, we would never have found our way. She not only skillfully typed our correspondence and drafts, but was extremely adept at convincing respondents that they really did want to let us interview them at the time we were in their community. Our research project was administratively housed within the Community and Organization Research Institute, and the Institute's Administrative Assistant, Barbara Hagen, carefully guided us through the University's various bureaucracies. Joan Dandona produced the final manuscript and showed us the virtues of word processing equipment.

During the early stages of our research, we were aided by the suggestions of an Advisory Committee. Special thanks

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While gratefully acknowledging the substantial assistance provided by all of the above, we quickly absolve them of any responsibility for what is contained within this report. We mutually share that burden, and blame each other for any mistakes.

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Executive Summary

California is earthquake country. Most of the state's population live in areas which could suffer major damage and loss of life from a catastrophic earthquake. Many experts feel that such an earthquake is likely before the end of the twentieth century. Over the two decades from 1960 to 1980 California has adopted several laws designed to reduce seismic risk. These laws deal with land use, building codes, school and hospital construction, and planning for emergency response to a seismic event.

Government is a central actor in the process by which society makes choices about the way it will respond to the risks posed by earthquakes. These choices lead to various levels of reduction in seismic risk. Local government plays a central role in this choice-making process. The primary purpose of this research is to examine the way in which selected California communities plan and implement seismic safety policies.

There is little social science research that deals with disasters and their impact on the social community. Very little of this research includes government as a focal point. Using a simple and straightforward model of decision-making, with an emphasis on the implementation

phase, this research covers thirteen California local jurisdictions. We concentrate on seismic safety as an issue on the policy agenda of local government from 1969 to 1980.

Seismic safety as a public policy issue has a number of important characteristics that condition the way in which it is perceived and applied. First, it is not a highly tractable issue, i.e., it is not a policy that is easily dealt with by public policy. Second, it is not an issue which has a highly visible and organized public to support it. Thirdly, it tends to be dealt with at the bureaucratic level.

We utilize a case study approach. While we recognize the inherent limitations of this approach, the depth of investigation and analysis afforded by a limited number of cases provides us with manageable endeavor and an opportunity to explore events and relationships in some detail.

Cities and counties are important units to study because they have principal responsibility and considerable discretion in the seismic safety policy area. According to the criteria guiding our selection of research communities, the sample had to include:

1. jurisdictions with and without recent (approximately 10 years) experience with a damaging earthquake.
2. jurisdictions from both metropolitan and free standing non-metropolitan areas.

3. jurisdictions from the northern and southern regions of the state.

4. jurisdictions that exhibited at least some minimal level of seismic safety activity.

Using these criteria we selected thirteen jurisdictions. Those with recent earthquake experience are: Los Angeles City, Los Angeles County, Burbank, Glendale, San Fernando, Simi Valley, and Santa Rosa. Those without recent earthquake experience include: Alameda County, Oakland, Hayward, Fremont, Berkeley, and Salinas. All of the jurisdictions except Salinas and Santa Rosa are part of a metropolitan area

The first data collection effort consisted of gathering information about the history, politics, economic base, and social structure of the research communities. In the course of this task, we gleaned an impression of seismic safety activities in each jurisdiction. Then a detailed and careful search for documentary evidence of seismic safety policy was conducted. This task required an examination of the minutes of meetings held by planning commissions, city councils, and boards of supervisors. It also meant a reading of seismic safety elements and general plans as well as numerous reports and pieces of correspondence. Finally, a series of interviews were held in each community; a total of 238 in all. Public officials as well as relevant private sector individuals were interviewed.

Both individuals and communities must make choices about seismic safety. The choices made by individuals are often heavily influenced by the decisions of government, and governmental decisions are influenced by the perceptions decision makers have of citizens' attitudes and behavior on seismic safety. Because an earthquake is a low probability event for individuals, even its potential for serious damage does not usually overcome tendencies toward denial, fatalism, and ignorance. Furthermore, the political agenda of a community is always crowded with issues demanding immediate attention because of perceived imminent problems or threats; it may be hard for seismic safety to establish itself on an already crowded political agenda.

The state has mandated many actions by local governments in the seismic safety area. These mandates have at least temporarily placed the issue on local political agendas, but the mandates typically leave local government with considerable discretion when it comes to specifics. What a local government chooses to place on its agenda, and the manner in which it deals with the seismic safety issue, depends upon (1) perceptions of the severity and tractability of the problem, (2) available resources, and (3) the relationship of seismic safety to competing public issues.

Public officials interviewed in this research perceived very little concern in the general public over seismic safety issues. However, most public officials felt that

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citizens possess a relatively high level of awareness of the potential risk from earthquakes. Some public officials argued that public concern was low because of widespread confidence that local government was taking appropriate steps to mitigate the risk; no evidence was presented to substantiate such claims.

When public officials were asked about their own perceptions of the importance of seismic safety issues, they placed it higher on the agenda than did the citizenry. Most public officials expressed the opinion that seismic safety was an important agenda item for local government. Yet most public officials felt that local government was taking low level interest in seismic safety. This was the case despite the perception of most respondents that seismic risk was either high or moderate.

Buying earthquake insurance is one way for the public to register its concern over earthquakes. Insurance represents a means to mitigate loss. Using admittedly incomplete data, this research suggests that very few homeowners in the research jurisdictions have purchased earthquake insurance. Cost of the premiums, large deductibles, and a belief that federal aid would be forthcoming were cited as reasons for the low level of insurance coverage.

Land use planning is another way to mitigate damage and loss from earthquakes. Problems such as ground rupture,

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ground shaking, liquefaction, and landslides may be taken into account by land use planners as they consider development proposals. California requires every city and county to prepare a General Plan to guide local land use development. One required part of the General Plan is a Seismic Safety Element (SSE). The state has prepared guidelines for what ought to be included in a SSE.

After presenting a thumbnail sketch of each jurisdiction's SSE, the report then summarizes some of the main characteristics found in them:

1. No original data were collected in preparation of the elements.

2. Technical material is kept separate from any discussion of seismic safety policy.

3. Seven of the thirteen jurisdictions used outside consultants to write the technical parts of their SSE, while the remaining jurisdictions used in-house staff. There is some tendency for jurisdictions without previous earthquake experience to use their own staffs more than the jurisdictions with previous experience.

4. Jurisdictions without previous earthquake experience tend to produce noticeably shorter SSE's than the experienced jurisdictions.

5. Jurisdictions vary in their degree of compliance with state SSE guidelines. The more specific the guideline the fewer the number of jurisdictions following it.

Most jurisdictions have adopted SSE's that contain recommendations to (1) gather additional geologic data and (2) engage in some mild regulatory actions such as requiring soils and geologic reports in certain areas prior to issuance of building permits.

Very few of the research jurisdictions have fully implemented even some of their land use objectives as stated in their SSE With the exception of paying for the SSE itself, no jurisdiction has allocated money to implement the SSE. Only a few jurisdictions have provided any incentives for staff to implement seismic safety land use policy. Implementation of seismic safety land use policies does not stand in the way of efforts to develop land. Most local officials connected with land use planning functions seem indifferent or resigned to a relatively low priority for seismic safety within traditional land use planning activities.

In a rare exhibit of its preeminence in local land use planning matters, the state legislature passed the Alquist-Priolo Act. The law prohibits all structures designed for human occupancy from being built across a designated active fault. It also requires the state to approve geologic reports for subdivisions within state-identified special studies zones on either side of active faults. Eleven research jurisdictions have at least one special study zone. Questions about seismic safety become visible, important, and sometimes controversial aspects of developments proposed within a special study zone. Despite some legitimate questions about the accuracy of special study zone boundaries, the Act appears to be accomplishing its prime purposes of preventing structures across active faults and making design and location within a zone subject to careful scrutiny.

Four roles played by seismic safety in local land use decision making have been identified in this research:

1. conflict directly between seismic safety and other identified priorities.

2. tactical political use of seismic safety as one of many reasons for opposition to a proposed development.

3. sole or prime factor in a land use decision.

4. catalyst for land use change as direct result of earthquake.

Because most property loss, deaths, and injuries in an earthquake are caused by failures of man-made structures, the designing and construction of structures is an important ingredient in an overall policy on seismic safety. This research examines the development and application of seismic relevant building codes. The state requires all local governments to adopt the latest version of the Uniform Building Code (UBC) or something more stringent. The UBC contains design requirements to account for lateral forces generated during an earthquake.

All building codes, including the seismic design provisions, are subject to potential enforcement problems, four of which are: (1) misunderstanding of the code, (2) poor use of discretion by building officials, (3) inadequate plan review and inspection, and (4) corruption.

Every SSE recommends a careful survey and evaluation of old (pre-1933) buildings, with some action required after identification of hazardous buildings. Only Santa Rosa and Los Angeles City have undertaken a survey and evaluation. They also have programs leading to rehabilitation or removal of the identified hazardous buildings. Adoption of programs in these two cities stems from strong and continued support for an older building program by key elected and appointed officials. This has been combined with well placed support from some of the business community, professional groups, and sometimes the media. Burbank, Oakland, and Salinas are examples of jurisdictions more typical than Santa Rosa or Los Angeles because there is virtually no sentiment to engage in an older building modification and removal program.

Building inspection officials do not rate seismic safety as an important community concern. Nor do they think it is an important, difficult or time-consuming function of their own agencies. There is also a general reluctance to undertake abatement actions against older buildings because of beliefs that the risks from these buildings does not warrant the economic costs and social disruption involved. However, there are no apparent serious objections to the seismic design requirements on new buildings. Building officials and private developers seem to accept the need for the current UBC approach to seismic safety when applied to new buildings.

Several previous reports and observations have raised questions about the adequacy of emergency response planning (ERP) in California. Most observers see ERP in California as being in a rudimentary form with potential serious problems in responding to a major earthquake.

California law encourages ERP by local governments and the State Office of Emergency Services provides some assistance. The guidelines for SSE preparation suggest attention to ERP, but only cursory treatment is given to it in the typical SSE. Those jurisdictions with recent earthquake experience are more likely to have an SSE that evaluates ERP in at least a passing fashion than those jurisdictions without recent experience. Furthermore, those jurisdictions without recent earthquake experience which do have some evaluation of ERP in their SSE have not made any serious effort to implement the relevant recommendations.

Los Angeles City and Los Angeles County are exceptions to the generally inactive state of ERP in the research jurisdictions. They have clearly used lessons learned from the 1971 San Fernando earthquake in their subsequent ERP.

The certainty that California will continue to experience earthquakes results in an ever present risk to those who live in the state. Local governments must make policy choices that <u>de facto</u> establish the level of seismic risk found in their communities. Risk analysis is not an explicit, visible standard of judgment in the local decision-making process on seismic safety matters and, consequently, local officials exhibit little specific knowledge of existing or potential risk. This leaves California communities without a defined level of what risk is acceptable. By default, the status quo becomes the acceptable risk at any point in time. From the perspective of local government, whatever is current policy produces an environment that is safe enough.

Some communities have taken more and more significant steps to reduce seismic risk than others. These variations can be at least partially explained by five factors which facilitate or influence the adoption and implementation of risk mitigation policies by local governments: state mandates, previous earthquake experience, staff ability, attitudes of local governmental leadership and staff, and resources. Mitigation of seismic risk requires a long-term effort, and that is why it will always be problematic.

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CHAPTER ONE

Introduction: Research Objectives and Conceptual Frameworks

Earthquakes can lead to human suffering and loss of property. The destructive force of a major earthquake is almost incomprehensible. If it occurs in a highly populated area, damage can often be measured in the hundred of millions of dollars and deaths and injuries in the thousands. Yet this type of calamity remains a potentiality not experienced by most individuals, even those who live or work in areas of the highest seismic risk. Damaging earthquakes are not frequent occurrences when measured on the human lifespan calendar.

Seismic hazards are a function of geologic forces. Absent a threat to human life and property, earthquakes remain simply an interesting natural phenomenon. As population size and density have increased in the areas of the world subject to the natural force of earthquakes, seismic risks became a serious threat to people. It is the human choice to live in and build structures in seismically active areas that creates the risk. For example, the New Madrid, Missouri earthquake of 1811 may have been a very major earthquake, but the risk it posed to human life and property was quite small; the possibility of a repetition today presents a serious risk to the multitudes living in the potentially affected area. Likewise, a major earthquake on the Newport-Inglewood fault or the San Andreas fault in

Southern California represents a risk of stupendous proportions because of the large population, with the concomitant structures, now in the area.

Seismic risk, then, is a function of human choice. Choices to live in certain regions of the country, to build certain types of structures at certain locations, and to build an infra-structure of transportation and utility networks all contribute to the level of risk. Most of these choices are made by individuals and corporate entities, each of whom finds some economic or social advantage in locating at a given site. The preponderance of such decisions were made before seismic risk was fully appreciated or the means of mitigation were known.

Others are public decisions made by governmental bodies. The private and corporate choices now usually require tacit or explicit governmental approval. Government plays a major role in creating the level of seismic risk; even governmental inaction permits a certain level of risk to be "determined" by the private sector.

Given the central role government may play, it is appropriate that this research has its focus on the seismic safety activities of various governmental institutions. Seismic safety is the other side of the seismic risk coin. If human choices lead to a level of seismic risk, then it follows that human choices may introduce varying degrees of seismic safety. Our concern in this report is with seismic safety activities in California, and more specifically with the approaches to seismic safety taken by selected local governments in the state. This introductory chapter sets the scene for the subsequent body of the report. Our overall research objectives and strategies are the first subjects treated in this chapter. The second section quickly reviews the major steps in seismic safety taken by the state of California over the last several decades. In order to place our research in the context of other social science research on natural disasters, the third section of this chapter abstracts several important recent works and suggests some relationships between them and our current effort. A presentation of the research context and conceptual framework occupies the remainder of this chapter.

Research Objectives And Strategy

Little systematic, empirical research has explored the impact of existing seismic legislation.[1] Likewise, not much is known about the way in which local communities plan for earthquakes, why some communities seem more interested than others in such planning and preparation for disaster, and whether recent experience with an earthquake makes any difference for subsequent planning activities. Such research is clearly feasible and it offers the possibility of substantial policy relevance.

The primary objective of this research is to understand the way in which selected California communities plan and implement seismic safety programs and policies.

The research has its focus on local governments in two pairs of geographical areas having important similarities and, in some cases, significant differences: the policy responses of political institutions in two areas which have had earthquakes within recent times will be compared with those in two similar areas which have not had experience with an earthquake recently. With the occurrence of an earthquake as a major intervening variable, we will be able to study some of the ways in which an earthquake affects subsequent approaches to seismic safety by units of local government.

Since neither the earthquakes nor the political institutions of the areas we have chosen to study are matched pairs, we will not be arguing that there will necessarily be a linkage between the two similar areas. The similarity in demographic characteristics simply decreases the probability that non-government variables will be influencing the results we will be observing.

In examining the manner and extent to which various California communities undertake earthquake mitigation measures, we are inevitably evaluating the communication and learning processes that exist among the communities of the state. In juxtaposing communities of similar size, comparable demographic characteristics, and earthquake potentials within a given limited time period, we are able to assess whether communities not having had recent earthquake experience learn from the experiences of communities that have had such experience. The investigation invites a consideration of the processes of communication flows among communities -- perhaps through channels provided by state agencies or professional associations -- in disseminating information both with regard to the destructive consequences of earthquakes and the possible measures to mitigate damage and human suffering.

As indicated above, the objectives of this research are to investigate the relationship among several community variables, experience with earthquakes and without earthquakes, and the willingness of communities to adopt various elements of seismic safety planning. The investigators make no independent claim to knowledge of what constitutes adequate seismic safety. Such normative determinations may be based on recommendations made by professional groups and appointed commissions; the extent to which seismic safety planning takes place in California may be compared with approved standards. Ultimately, the desired level, if not the adequacy of seismic safety planning, must be determined by various decision-making bodies such as city councils, the state legislature, regional organizations, and perhaps federal and state agencies.

A fundamental premise of this investigation is that there is likely to be conflict over efforts to achieve seismic safety goals. The conflict arises because not all political actors accept all seismic safety goals. They may also disagree about the priority of seismic safety vis-a-vis other policy objectives, or they may differ on the means chosen to accomplish certain goals. Perceived economic or political advantages or disadvantages help fuel the conflict.

This research utilizes what is essentially a case study approach. Seismic safety planning in California, under varying conditions and in carefully selected locales, is the subject matter. This is an appropriate approach, in our opinion, for at least two reasons:

(1) California is a natural site for this kind of study because it is the location of most of the damaging earthquakes in the United States in recent years and because seismic safety and earthquake risks have been heavily discussed and publicized in the state.

(2) Given the relative paucity of knowledge about the seismic safety planning process, concentration on a few selected instances such as undertaken here allows the kind of in-depth investigation that should naturally precede any nationally based research. To put it more directly, it is our opinion that a full scale, in-depth case study of seismic safety planning in selected

California areas is more valuable at this stage than an effort encompassing all or even most seismically active areas of the nation.[2]

Without question, California is earthquake country. The popular identification of California with earthquakes is supported by historical evidence that earthquakes are more likely to occur in California than anywhere else in the United States, although not necessarily with more severity. In a study by the United States Office of Emergency Preparedness, it was found that 28 of the 45 major earthquakes recorded through 1972 took place in California. Of the total estimated property damage of $1.86 billion resulting from these earthquakes, fully two-thirds or $1.23 billion was incurred in California. Well over half of the deaths resulting from earthquakes in the United States (1029 of 1614) also took place in California.[3]

Perhaps more important than the historical record, California residents constitute a large percentage of the population of the United States that lives in high earthquake risk areas.[4] Based on 1970 census figures, it was estimated in 1972 that almost 31 million people, or 15 percent of the U.S. population, live in seismic risk zone 3; this zone is characterized by seismologists as having risk of major destructive earthquakes. In California 17.3 million people are located in zone 3. This means that 87 percent of the California population is subject to zone 3 risk. Studies by the

National Oceanic and Atmospheric Administration predict as many as 15,000 deaths and property damage of up to $25 billion if a major earthquake strikes either the San Francisco or Los Angeles areas.[5]

Bruce A. Bolt and Richard H. Johns, two widely recognized experts in seismology and geology respectively, recently commented on the possibility of a major California earthquake:

> In anticipating the next big California earthquake of magnitude 7 or higher, we must conclude that time is running out. The evidence strongly suggests that such an event must now be considered imminent. Until recently there has been a tendency to think of such an occurrence in terms of "the next 10 or 20 years." But now for several reasons, we can no longer keep pushing this "time window" into the future. In short, present evidence that a large earthquake is imminent in California is much stronger now than 30 years ago -- or even 10 years ago.[6]

California and Seismic Safety Policy

Californians have expressed their concern about earthquakes through the enactment of many laws and regulations which attempt to reduce the loss of life and property from the inevitable seismic events. Most of these laws emanated from the state legislature while some originated with local governments. Regardless of source, they are the result of extensive consultation, coordination, and lobbying by private individuals and public officials. This section provides an overview of the more important actions of the last several decades. The analysis of contemporary seismic safety planning -- the topic of this research endeavor -- must begin with an understanding of some historical precedents. This section discusses seismic safety and schools, hospitals, building codes, and land use planning.

Schools

The modern era of seismic safety planning dates from the passage of the Field Act in 1933. Coming right on the heels of a devastating earthquake that destroyed many public schools in Long Beach and Los Angeles, this law required local school districts to submit construction plans for all new school buildings to a state agency for approval. The Office of State Architect reviews plans prior to the commencement of construction. The Field Act also requires school districts to hire qualified persons to supervise actual construction.

The imposition of state supervision over the construction of new schools was never subject to serious controversy. However, when the legislature in 1939 started pushing local school districts toward the rehabilitation of pre-1933 buildings, opposition became vocal and frequent. It took several laws, an attorney general's opinion, and the provision of state financial assistance before the 40 year task of rehabilitating or abandoning pre-1933 school buildings was accomplished. The success of the Field Act and its legislative progeny was vividly illustrated in the 1971 San Fernando earthquake. Schools built in compliance with the Field Act procedures did not sustain any significant structural damage while many of the pre-1933 schools that had not yet been rehabilitated were severely damaged. Some of these damaged schools were beyond repair and were eventually demolished.

Hospitals

Although the state had regulated the design of new hospitals since the 1930's, and although this regulation had incorporated some attention to seismic risk in the reviews of hospital construction plans, it was not until the Hospital Act of 1972 that the state took a strict stance on seismic risks to hospitals. Modeled after the Field Act, the Hospital Act requires that plans for all new hospitals (of which there have been very few since 1972) and all major additions or alterations to existing hospitals be reviewed and approved by the Office of the State Architect. The state must also review seismological and geological reports on the land being used for every new hospital. Hoping to prevent a repetition of the collapsed modern hospital (Olive View Hospital) which occurred in the 1971 San Fernando earthquake, hospitals must now be designed and constructed to withstand very strong earthquake generated forces. There has been some criticism of these stringent requirements, but they still stand. In the short time span since the Hospital

Act was passed, there have already been several amendments; undoubtedly, there will be more. The amendments have exempted certain small hospitals from the Act's provisions and have specified requirements for anchoring important hospital equipment so that it will not cause injury and will be functional after an earthquake.

Building Codes

Building codes of one kind or another have been used by local governments in California for several decades. Since World War II there has been serious and continuous effort to upgrade the building codes so as to keep abreast of advances in knowledge about structural performance during an earthquake. All local governments must have a building code which incorporates the seismic design requirements of the Uniform Building Code (UBC). A code which is more stringent than the UBC is permissible. Several Californian based engineers, architects, and earth scientists have been deeply involved in the preparation of the UBC seismic requirements. Therefore, it is argued that although the UBC in intended for national implementation California circumstances have been adequately taken into account. The way in which building codes are enforced and attitudes toward the codes and their enforcement are subjects for this research.

Land Use

The potential for mitigating earthquake-caused human loss and property damage through "proper" land use planning is tremendous. Clearly, the potential has not been realized. In fact, a not altogether facetious remark is often made which indicates the alleged lack of concern over good land use practices: "If you want to locate faults, first locate all the schools and hospitals because they are built on faults." Three consequences of earthquakes can play a very important role in land use decisions: liquefaction, ground rupture, and ground failure such as landslides. While it is apparently impossible to be totally certain, reasonably accurate predictions about ground performance during earthquakes are possible. These predictions can be used as a guide to local governments and private parties in their land use decisions. There is evidence that land use decision-making is incorporating seismic concerns to some extent.

Two state laws passed in the wake of the San Fernando earthquake seek to make seismic risk an important part of local land use decisions. For more than two decades all cities and counties in the state were required to have a General Plan which incorporated many different aspects of land use planning. In 1971 the legislature required that all local jurisdictions complete a "Seismic Safety Element" of their General Plan by 1974. By requiring local governments to identify the seismic risks within the jurisdiction, legislators hoped to encourage local public officials to take earthquakes seriously as they deliberated upon proposals for development of specific land parcels. While preparation of a Seismic Safety Element is mandatory, the local jurisdictions have considerable latitude in deciding upon the Element's adequacy and the role the Element will actually play in decisions.

After the 1971 earthquake, the legislature also passed the Alquist-Priolo Special Zone Act, in which it recognized the importance of proper land use planning. This Act identified four well known active fault zones and directed the State Geologist to designate other active faults in the state. No structure used for human occupancy, except single family homes not part of a subdivision, may be built across an active fault trace. The fault zone is assumed to have a width of 50 feet on either side of the known fault location unless a geologic report shows otherwise. All real estate transactions within the designated zone must contain a disclosure by the seller that the property is within a special studies zone. The State Geologist designates the special studies zones, but local governments must enforce the restrictions.

The Disaster Literature:

Social Science Research On Disaster Impacts

A small but increasing body of social science literature explores the consequences of natural disasters. The literature can be organized by the unit of analysis employed. Some research focuses on individuals, some concentrates on specific community organizations, and some research efforts use the whole community as the analytic unit. Very few of these studies pay attention to government as an important variable; those that do study government usually treat it as one of many community organizations which may be impacted by a natural disaster. The dearth of government-focused research vis-a-vis natural disasters is accentuated further when only earthquakes are considered. Very little earthquake research exists in which government is accorded attention as the primary object of the research.

This section briefly surveys some important social science disaster research so that our investigations of seismic safety policy in California can be seen as part of a larger body of research on natural disasters. We make no pretense here of treating all disaster research, but only those recent studies which, in our judgment, are important and bear on our own efforts.[7]

Writing in 1969, William Anderson examined twenty-three organizations in Alaska that had some involvement with the

1964 earthquake in the southern part of that state.[8] Nine of these organizations were governmental; seven were part of Anchorage city government and two were state agencies. Anderson found evidence of long-term changes in many organizations, particularly the governmental organizations. He concluded by stating that "This study provides additional evidence to support the proposition that durable social systems change may grow out of circumstances created by natural disaster.[9] But at the same time Anderson emphasized the rather modest nature of most change and he suggested that the research "indicates the strong continuity in human social organization."[10] A few examples will illustrate the level of change Anderson observed in governmental organizations as a consequence of events precipitated by the earthquake. The Anchorage Police Department decided to develop a reserve unit for use duing emergencies and they also developed a call-up procedure to reach off-duty officers immediately following a disaster. The Anchorage Fire Department saw its responsibilities for fire prevention work at the port greatly increased as the port dramatically increased the tonnage it handled; a new staff person was added for this task. The Anchorage Civil Defense Office saw its prominence rise, and its staff and budget as well. Finally, officials at the Anchorage Municipal Light and Power (owned by the city) accelerated plans they had been discussing before the earthquake to install equipment which would isolate areas of the city in case of electrical failure so that the entire city did not lose power. Anderson apparently made no effort to study the way in which the earthquake may have affected political processes in Anchorage generally or such bodies as the City Council or Planning Commission.

The major compendium on the status of research on natural hazards by Gilbert White and J. Eugene Hass identified major gaps in the social science treatment of all natural hazards.[11] They suggested that "natural hazards research in our nation is spotty, largely uncoordinated, and concentrated in physical and technological fields...relatively little is done [in research] in relation to the economic, social and political aspects of adjustment to natural hazards."[12] When it comes to earthquakes, White and Haas suggested that we know very little about such important areas as the way land use management can effectively promote seismic safety, why building code utilization to mitigate earthquake hazards occurs in some jurisdictions and not in others, and how to reduce or even eliminate the hazard posed by older buildings which are currently used by high concentrations of people. Their book is at once an articulation of important lacunae in knowledge and a well reasoned plea for the support necessary to encourage research that would have practical payoff.

After offering a useful, but necessarily general, definition of disaster as "any abrupt, non-man-made event which causes some destruction or damage to a particular social, economic, and political system," H. Paul Friesma and associates present the results of their research on the long-term social and economic consequences of four disasters in four separate communities.[13] Their research sites were (1) 1955 Yuba City, California flood; (2) 1961 Hurricane Carla in Galveston, Texas; (3) 1965 tornado in Conway, Arkansas; and (4) 1966 tornado in Topeka, Kansas. The authors were testing what they argue is the commonly held view that disasters lead to long-term economic and social benefits for the impacted community (e.g., decrease in unemployment, recapitalization of industrial base, greater sense of community pride). Their level of analysis was the community and as such they relied upon a variety of social and economic aggregate data. Friesma, _et al_. arrived at two important conclusions:

1. "We could find no social patterns which were changed in a way which we would call permanent or even long-term."[14]

2. "The pervasive conclusion from visual analysis of many graphs and more systematic testing of time-series data is that the disaster caused little economic change."[15]

Rather than finding social or economic benefits from disasters, Friesma, _et al_. find no discernible impact; disaster did not seem to make any long-term difference.

Like Friesma, _et al_., James D. Wright and his associates were concerned about long-term consequences that may be attributable to natural disasters.[16] After reviewing previous literature on the subject, (including those mentioned above), Wright, *et al*. find confusion:

> It appears that virtually all logical hypotheses about the magnitude and direction of long-term, community-level disaster effects have received at least some empirical support. Disasters, that is, may have clear positive effects, clear negative effects at least from some elements of the stricken population, may accelerate pre-disaster trends, or simply may not have any long-term effects at all.[17]

Wright and his colleagues argue that all previous research has been methodologically deficient. They blame most of this confusion on the use of different methodologies by the various authors. (We will respond to their critique in the next chapter when our own methodology is presented.) They proceed to look at all major floods, tornadoes, hurricanes, and one major earthquake which occurred between 1960-1970 in an attempt to see if these natural disasters had any long-term impact. They find "no discernible effects of either floods, tornadoes or hurricanes on the changes in population or housing stocks experienced by counties [their unit of analysis] in the period 1960-1970."[18] The authors also examined housing values, rents, age composition, educational level of the population and family income and they see "no coherent interpretable pattern."[19] In sum, Wright and his colleagues conclude that through their methodologically sophisticated research design they have resolved the earlier confusion and can confidently report that natural disasters leave no long-term social or economic impact on affected communities.

What happened to the land use plans of three cities hit by damaging earthquakes was the subject of a research project by William Spangle and associates.[20] The Spangle study compared pre- and post-earthquake land use maps and land use practices in Anchorage, Santa Rosa, and San Fernando. In Anchorage and San Fernando, land use trends many years after their earthquakes were quite similar to plans that were underway prior to the disaster. Santa Rosa, on the other hand, showed major changes after the 1969 earthquake, especially in the central business district. Several explanations for the Santa Rosa situation are offered, including the presence of city staff who were very interested and commited both to hazard reduction and a growing local economy.

Finally, we call attention to one of the few efforts by political scientists to study natural disasters. F. Glen Abney and Larry B. Hill studied the impact of a natural disaster upon a local election.[21] Specifically, they investigated the consequences of Hurricane Betsy (September 9, 1965) on the next mayoral campaign in New Orleans. Noting the stress placed upon local government and its elected leaders by the crisis-like atmosphere in responding to a major disaster, the authors suggested that the opportunity for failure was quite high. They also show how skillful incumbent elected officials can utilize the resources of government to create a positive impression of the government's response -- and their own re-election -- despite concrete evidence of pre-disaster inattention to damage mitigating measures. Abney and Hill conclude:

> This exploratory study demonstrated that the political repercussions of a natural disaster are not automatically detrimental to the government in power. Instead, the political reaction may depend upon the government's capacity to neutralize the resulting stresses on the political system and upon certain relevant aspects of the political culture.[22]

Ralph Turner and several colleagues conducted a panel of public opinion surveys about earthquakes and earthquake prediction in Southern California. Most of their research was focused on public awareness, salience, and attitudes about earthquakes. They also solicited opinions about the role government ought to play in seismic safety efforts. What emerged from the data was a clear preference for governmental activism when it came to earthquakes. These feelings held constant even after voters expressed their strong desire to reduce local government revenues by approving the drastic tax-cutting of Proposition 13. Turner summarizes:

> In our early surveys, people overwhelmingly looked to government to take the lead in dealing with earthquake hazards, and overwhelmingly endorsed the spending of large sums of government money on reducing earthquake hazards. So we asked people, after the Proposition 13 vote, if they now thought the right amount, too much, or not enough money was being spent on earthquake safety. The majority of people said there was not enough government money

> being spent...We then asked if their views had changed as a result of Proposition 13. Most of them said they had not. Those who said their views had changed generally said they now believed that more money rather than less money should be spent.[23]

This brief review of some recent disaster research literature shows how several authors have answered a basic question -- What difference does disaster make? White and Haas, writing in 1975, argued that we do not know too much about the impact of disasters on social, economic and political aspects of local communities. They suggest future research needs. Friesma and Wright, using different methodologies, say that disasters leave no long-term impact on social and economic characteristics and trends. Abney and Hill suggest that a disaster probably afforded an incumbent politician a good opportunity to stay in office at the next election -- in that sense the disaster made a difference. Two of the studies we have reviewed looked at the impact of a disaster not on social and economic characteristics and trends, but on the consequences the disaster had for the way in which certain organizations and communities will respond to the next major emergency. Anderson found some changes in public organizations in Alaska, and Spangle and associates found one of the three cities studied did make significant changes in land use trends as a result of their experience with an earthquake. Turner's research documents the public's preference that government take an active role in mitigating seismic hazards. Clearly, the research that relied upon aggregate data (Friesma and Wright) produced results different from the research which looked at a small number of communities or organizations and gathered data from personal interviews, surveys, document analyses, and personal observation.

With the possible exception of Abney and Hill, none of the literature reviewed concentrated solely on government and the political process. None of the literature reviewed (and many other sources not specifically mentioned above) deals with the important question of <u>how</u> communities go about planning for major disasters: This is the focus of our study. At the same time, our research makes a contribution to the concern of many authors about whether disasters -- earthquakes in our case -- have long-term consequences that can be identified and differentiated from (1) what was being done in a community prior to the disaster and from (2) what is happening in other communities which are at risk but have not suffered from an earthquake in recent times.

Stated somewhat differently, we are looking at the long-term -- <u>defined as ten years</u> -- effects of an earthquake on the way in which local governments behave with respect to seismic safety, including the way in which they plan for the next earthquake. Of course, we must also take into account more than just the last ten years because historical events and trends are often important influences on current policy-making. However, our major attention focuses on what has happened since the 1969 Santa Rosa earthquake and the 1971 San Fernando earthquake in both those communities effected by the earthquake and some communities which did not even feel the temblors. Our primary unit of analysis is local government, although we will also focus on certain key individuals. Where appropriate, we shift our analysis to the larger community.

A Research Context for Understanding Seismic Safety Policy-Making

Understanding the way in which local governments make and implement seismic safety policy is facilitated if we outline the broader context within which that policy is considered. In any local jurisdiction there are dozens of issues which may find their way onto the public agenda. The way in which seismic safety policy is made must be viewed as a part of a much larger, diverse and on-going political process. Most of what local government does bears no relationship to seismic safety.

Political scientists and sociologists have developed and advocated many different ways to conceive of the local government decision-making process. While not offering any new insights, a recent summary and condensation by Demetrios Caroley is helpful.[24] His model of the local decision-making process has the advantage of being straightforward and applicable to seismic safety policy. Figure 1-1 presents a slightly adapted version of the model suggested by Caroley. This very simple model has been chosen strictly for its explanatory ability and the structure it provides in organizing the progression of ideas in this report. We fully realize its generality and limitations.

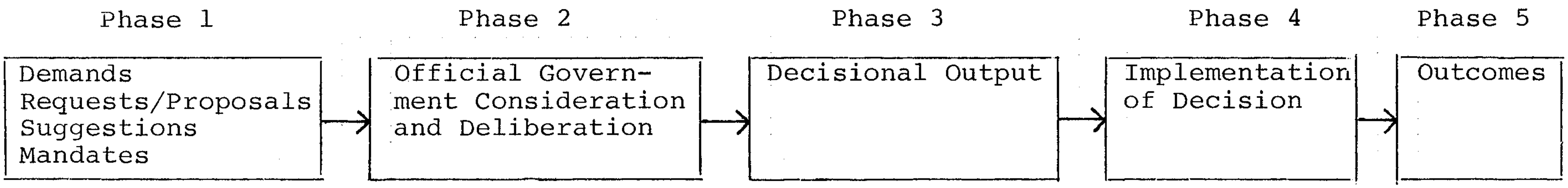
Preliminary Comments

If the model portrayed in Figure 1-1 is to be useful in this research effort, several clarifying and elaborating comments must be made. For our purposes the model will be used only to facilitate the study of local government decision-making. It is important to keep in mind that the decision-making process is inherently a political process. That is, the process is conflictual because there will be disagreement over goals, and frequent disputes about the means for their accomplishment. In the seismic safety field, this conflict will center on economic questions, i.e., who pays and who benefits, and it will encompass disagreements about the appropriate role for local government. As in any political process, seismic safety policy is usually determined through the exercise of political influence by those people and groups interested in the issues.

The importance of making this apparently simple-minded assertion that seismic safety policy is the result of a pol-

FIGURE 1-1:

A Model of the Local Government Decision-Making Process



Source: Adapted from Demetrios Caroley, City Governments and Urban Problems. Englewood Cliffs: Prentice-Hall, 1977, pp. 30-35.

itical process stems from the nature of seismic safety concerns. This is a policy area in which experts possess knowledge not readily available or understood by the lay public or public officials. As in other policy areas in which technical expertise plays a strong role, there can be a certain tendency by the participants to believe that the "facts" and the "truth" will speak for themselves; the interaction of competing interests, that is, politics, is somehow assumed to be unnecessary and foreign to seismic safety policy. But the world is not that clear cut. Facts are often disputed by the experts and the truth is not at all self-evident. In other words, the evolution of seismic safety policy takes place in a less than certain arena in which those holding different viewpoints will exercise their constitutional rights to have their version of truth adopted -- thus, politics. The neatness and sequential numbering of the phases of the decision-making process as seen in Figure 1-1 belie the untidy and non-sequential manner in which most public policy is made. This model -- as is the case with any model -- is a simplification of the real world and it must be viewed that way. For instance, the process rarely proceeds from one phase to another without some movement back and forth. We should also remember that many interesting and important actions take place within each phase through the interaction of the people involved.

Two issues superimpose themselves on our use of the model and, therefore, condition our research effort: federalism and the nature of government in metropolitan areas. While we focus our efforts on local government and the local political process as it develops an approach to seismic safety, it is impossible to ignore the larger governmental context. As we will show, both the state government, and to a lesser extent, the federal government play a role in seismic safety policy. Because of the constitutionally superior position the state enjoys vis-a-vis local governments, the state government can promulgate general policy goals as well as mandate local governments to perform specific actions. The federal government's role in seismic safety policy has been restricted primarily to disaster assistance after a seismic event. However, there is some evidence that the federal government may start to play a larger role in pre-disaster planning and mitigation. Because of the role that the state and federal government can play in seismic safety policy, we have conceived of these two levels of government as important actors in a study of local government.

Government in metropolitan areas is quite fragmented. As will be detailed subsequently, two of our research locales are metropolitan in nature; thus fragmentation becomes important to our research. In most metropolitan areas of California, there is a multiplicity of governmental units which are responsible for providing public services. When our model of the decision-making process refers to "local government," it in fact means a wide array of geographically, functionally, and legally different units of government. The Los Angeles metropolitan area, for example, is governed by over seventy-five separate, independent units of general local government. In addition, there are scores of special district governments which provide services such as water, sewer, street lighting, libraries, cemeteries, parks, flood control, etc. Many of these special districts are governed by elected boards of directors, while others fall under the legal jurisdiction of the County Board of Supervisors.

In dramatic fashion Douglas Yates points to the serious consequences that flow from governmental fragmentation.

> My argument is that urban fragmentation profoundly affects policy-making in the city...the systematic fragmentation leads to a political and governmental free-for-all that makes urban policy-making chaotic and unstable. More precisely, the fragmentation of urban government at every level produces an almost anarchic structure of demands and policy conflicts. It produces scores of individual and institutional interests which "fight" over urban programs and policies in a policy-making context (of procedures and decision networks) that may vary with every "fight." I call this unstable political free-for-all "street fighting" pluralism and use the concept to describe a pattern of unstructured, multilateral conflict in which the many different combatants fight with one another in an almost infinite number of permutations and combinations.[25]

If this observation by Yates is an accurate picture of urban policy-making, then it is easy to understand why seismic safety policy is not always straightforward, rational, consistent, and forward looking. But if Yates is right, then seismic safety policy is not different than other policy areas.

Officials of both the general purpose local governments and the special districts often become key actors in the seismic safety decision-making process as they interact with each other. In some aspects of seismic safety policy-making, the local governments are the only actors involved and private citizens or interest groups have little or no involvement. For purposes of explication, the discussion in this chapter deals with the entity called local government, but subsequent chapters provide more detailed and subtle distinctions so as to take into account the fragmentation of metropolitan local government.

A Decision-Making Framework

We can now examine the Caroley decision-making model. (See Figure 1-1.) Phase One suggests that public policy can originate from a variety of sources, both within and outside of government. Demands, requests, and proposals can come from individual citizens or private interest groups who want change. Suggestions, too, may come from the private sector. Individuals within government may also request, propose, or suggest policy; rarely do they demand. Mandates refer to policy which originates from a higher level of government.

Local governments are often told that they must follow a certain policy developed by the state or federal government.

Policy may also originate in different forms ranging from mildly stated suggestions to strongly worded demands backed by political power. Mandates are requirements imposed upon local governments, but their format may range from a vaguely stated policy objective for local governments to a specifically worded requirement that local governments perform a particular act or function within identified guidelines.

In one sense, all policy originates from what Anthony Downs calls a "performance gap."[26] That is, a difference is perceived between what government is doing and what someone or some group thinks government ought to be doing. A performance gap is based on perceptions and values about what is right and proper.

The source, form, and format of policy which originates in Phase One shape the way in which the decision-making process responds, and they also influence the output of the process. For instance, it can be hypothesized that mandated seismic safety policy from the state will be received and implemented by local decision-makers in a fashion different from a locally originated policy. Citing another example, a suggestion or request made to a local government by a citizens group for development and implementation of a particular seismic safety policy will be received differently than a demand accompanied by a threatened political or legal sanction.

Phase Two of the decision-making model -- Official Government Consideration and Deliberation -- is activated when "a policy demand or the existence of a problem likely to lead to a policy demand penetrates the city government structure by coming to the attention of some elected or appointed city decision-maker with the legal power to act."[27] When an issue moves from Phase One to Phase Two it becomes part of the formal agenda of government. Cobb and Elder define the formal agenda "as that set of items explicitly up for active and serious consideration of authoritative decision-makers."[28] There are two important variables which control the movement of an issue onto the formal agenda: (1) the group or person presenting the issue must be perceived as legitimately involved in the issue and (2) the issue itself must be perceived as a legitimate concern and potential activity of government. Perceptions of decision-makers and influential political persons and groups that local government involvement in some seismic safety policies is inappropriate have kept some things off the formal agenda. This is not necessarily the result of some pernicious attempt to submerge seismic safety issues. Rather, the policy agenda is usually full of issues and policy-makers only have a finite amount of time and energy. As Edwards and Sharkansky point out:

> There is a limited amount of time, money and personnel to handle policy problems. Issues must compete for a position on the agenda and when one issue gains prominence, it may bump others...The policy agenda is clogged with issues.[29]

While seismic safety may not reach the formal policy agenda because of an "innocent" and "objective" assessment of the available room on the agenda, it is also possible that there are systematic efforts to dissipate or even bury seismic safety as an appropriate issue. Some people or groups may stand to benefit, or at least not be hurt, if seismic safety is never placed squarely on the policy agenda. It proves methodologically difficult to gather data on this possibility, but our efforts and the results are reported in subsequent chapters.

Therefore, it is a combination of the content (Phase One) with the perceptions and attitudes of official persons which determines the location of seismic safety policy on the formal agenda. Many items in Phase One get buried and lost in the transition to Phase Two; the transition is never automatic. In any event, it is very unlikely that items raised in Phase One proceed through Phase Two without some alteration or modification. Discussion of how and why these changes occur occupies much of our attention in subsequent chapters.

Once an issue finds a place on the policy agenda in Phase Two a decision about it usually ensues and becomes the "Decisional Output" of Phase Three. The output is the decision. The decision can take many forms, including intentional or unintentional delay. It is not uncommon for a decision to encompass only part of the issue -- either partial victory or partial defeat, depending upon one's perspective. Finally, the decision may represent adoption or defeat of the issue in totality.

Because we have a complex governmental structure at all levels, and because there are so many different access points for interest groups, it is rare for an issue to move smoothly forward toward final resolution. Delay is quite common. It is only the exceptional issue that does not encounter delay in the form of considerable movement from Phase One to Two and back, as well as meandering around within government as part of Phase Two. Moreover, the complexity of some issues and the constantly changing nature of the technological knowledge about some issues (including seismic safety) precludes a truly final resolution. Some issues seem to be around forever and are the topic of decisional outputs year after year.

The primary task of our research with respect to Phase Three requires that we accurately portray what was done by government and then explain why. Among other things, we will try to explain the relationship between the process which occurs in Phase Two and the output seen in Phase Three. These linkages are important to understand in themselves, but also because their comprehension is necessary for an explanation of what takes place in Implementation (or Phase Four) of the decision-making model.

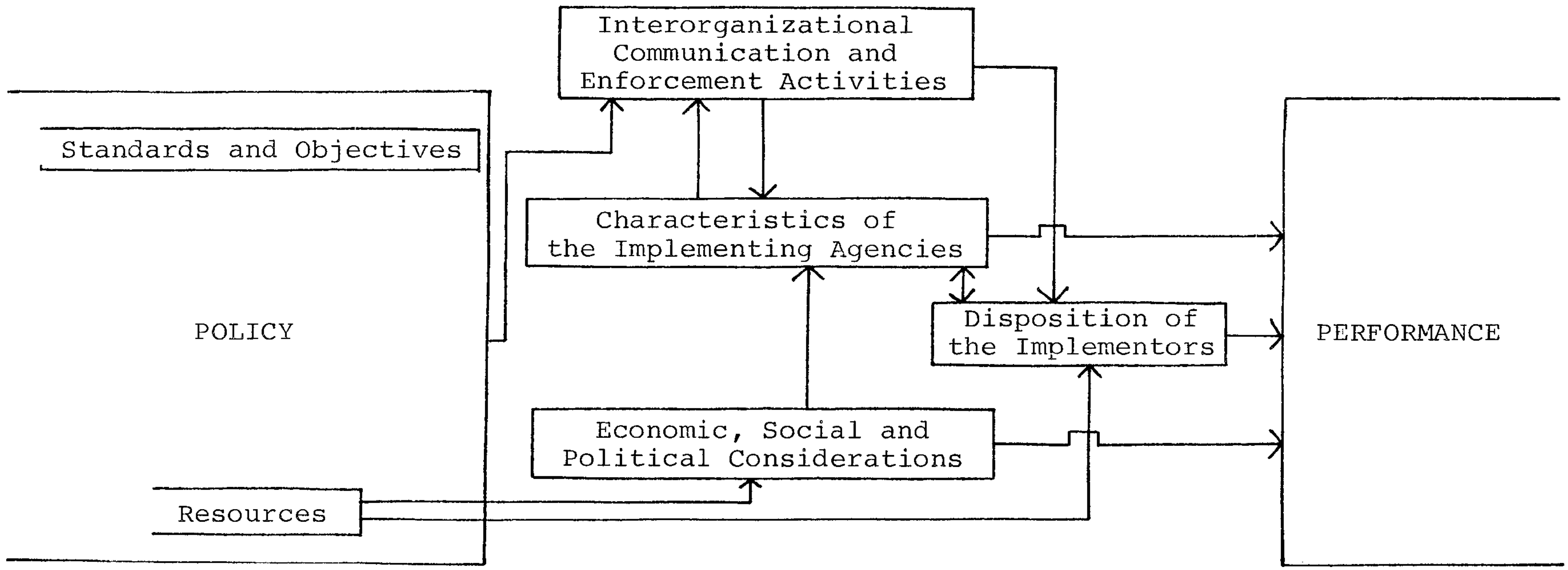
Nakamura and Smallwood define implementation as the "process of carrying out authoritative public policy directives."[30] Implementation, then, refers to the operationalization of the decisional output (Phase Four of the Caroley model). Obviously, if delay becomes the decision, then not much in the way of implementation occurs. Similarly, if an effort to produce a new or modified policy fails because of a clear-cut refusal by government officials, then again implementation amounts to nothing. When the decisional output is affirmative, it usually carries with it the expectation of implementation. Government may adopt policy with only symbolic intent, in which case implementation may be moot. The circumstances surrounding seismic safety policy adoption do not make it a symbolic act; implementation seems appropriate. Adoption of a Seismic Safety Element by a city council, for instance, gives the impression (at least implicit) that an effort to implement the policies expressed in the Element will be forthcoming.

It has become increasingly obvious that the implementation of public policy rarely proceeds in smooth fashion.[31] The tasks of implementation presents challenges as great as those faced in earlier phases of the decision-making process. One author refers to implementation as an "Achilles Heel" in all policy-making processes.[32] Implementing public policy is a complex endeavor requiring careful and skillful maneuvering by those officials committed to the effort. In some respects, more opportunities for sabotage by a policy's opponents may exist during the implementation phase than earlier. Thus, implementation is a complex phase.

The complexity arises from the varied people, interests, and governmental units typically involved in implementing policy of any magnitude. One common feature of the implementation phase is delay; complexity breeds delay. Even when officials are working with a clear statement of policy intent, the process of implementation usually involves extensive bargaining between and among the many participants involved. Issuing commands through a command structure in the stereotypical military fashion does not represent the leadership style usually found in local governments. Putting this discussion in the context of seismic safety, when a city council adopts the seismic requirements of the latest Uniform Building Code it does not automatically follow that these seemingly precise requirements will actually be implemented in a timely and effective fashion.

To underline the complexity of the implementation phase, as well as to summarize what seems to happen as implementation proceeds, we can refer to a model developed by Van Meter and Van Horn.[33] Figure 1-2 illustrates their model. "Policy" for Van Meter and Van Horn corresponds to

Figure 1-2: A Model of the Policy Implementation Process



From: Donald S. Van Meter and Carl E. Van Horn, "The Policy Implementation Process," Administration and Society, Vol. 6, No. 4, February, 1975, p. 463.

Phase Three -- Decisional Outputs -- of the Caroley decision-making model. "Performance" is the result of the implementation phase and directly feeds into, and is largely responsible for, the outcomes in Phase Five of the decision-making model.

Because much of what follows in subsequent chapters focuses upon implementation, a few comments clarifying our understanding of the Van Meter and Van Horn model may prove helpful. One of the key ingredients in any successful implementation must be the provision of resources commensurate with the tasks specified in the policy's standards and objectives. The easiest way to wound a policy fatally is by the failure to allocate money and staff in sufficient quantity -- and sometimes quality -- to get the job done. Successful implementation of an ordinance to remove or rehabilitate pre-1933 unreinforced masonry buildings in danger of collapse from an earthquake probably cannot occur without providing additional resources to the relevant agency.

By highlighting the "Interorganizational Communication and Enforcement Activities" and the "Characteristics of the Implementing Agencies," the model reminds us that more than one agency is often involved in implementing a policy. We need to examine, for example, the interaction between a city fire department and the public works department to understand how they implement an emergency response plan. And we should know something about the major operating characteristics of these agencies in order to explain why the implementation proceeded as it did.

The way in which policy is to be implemented does not always present itself in obvious fashion, and it is surely not without its own consequences. Therefore, political actions emanate from economic and social consequences -- or anticipated consequences -- of implementation. Implementation can generate controversy over who will benefit and who will lose from the approach adopted. That controversy can be highly political in that the affected parties will use their influence in order to press their perspective and advantage.

As the model in Figure 1-2 indicates, the disposition of those charged with implementation becomes a major variable in determining the nature and extent of the performance. It would be quite erroneous to assume that public officials act in robot-like fashion to carry out directives given to them by authoritative bodies such as city councils.[34] Public officials, call them bureaucrats or administrators, bring their own personalities, motivations, and goals to their tasks. The way they perceive the adopted policy, its appropriateness and soundness, is filtered through their value structure. A planning department director "sees" a Seismic Safety Element as an individual and as a public official. Without trying to put public officials on an analyst's couch, we nevertheless must assess their predispositions about any given seismic safety policy they are attempting to implement. Subsequent chapters will show how these dispositions can affect policy adoption and implementation.

The final phase of the Caroley decision-making model is labeled "outcomes". Outcomes are the consequences -- both intended and unintended -- of the implementation phase. What does the implementation of a policy cause to happen? What are the consequences that flow from implementing a Seismic Safety Element or the seismic design requirements of the UBC? There are usually few objective indicators of consequences; judgments must be made. In making those judgments, we will rely upon both the evaluations of consequences offered by a wide variety of respondents interviewed as part of this research as well as our own conclusions.

As we will show later, many policy alternatives have not been adopted by local governments and frequently there is less than successful implementation of those policies that are chosen. We have defined outcomes as consequences of implementation, but a more complete picture emerges when some assessment of the consequences of non-adoption and non-implementation is added. Of course, at this point the conclusions become more speculative.

Seismic Safety As A Policy Issue

Having described the decision-making model and provided some clues about its relevance to seismic safety policy-making, a few important caveats about the very nature of seismic safety policy must be stated. What kind of issue is seismic safety? What are some distinctive characteristics that may significantly influence the way in which the decision-making process functions? Sabatier and Mazmanian offer a framework for studying policy implementation that features one concept important for understanding seismic safety policy.[35] Research seeking to explain such dependent variables as the policy decisions of public agencies, compliance of target groups, and the perceived and actual impacts of a policy must take into account what Sabatier and Mazmanian term the "tractability" of the problem. They introduce the concept of tractability as it relates to policy implementation by saying:

> Totally apart from the difficulties universally associated with the implementation of governmental programs, some social problems are much easier to deal with than others.[36]

While there are surely public problems of greater complexity and difficulty, seismic safety, nevertheless, is not an easy problem. Its tractability, or solvability, probably ranks somewhat low. For instance, the benefits from seismic safety policy implementation are not always obvious. Rather, an act of faith is required by officials and the public, both of whom may never have experienced an earthquake nor know much about them. Lack of personal experience or acute awareness of potential earthquake damage or of possible mitigations -- all of which accurately characterize most people in public office -- makes seismic safety a less tractable issue. Designing buildings in a certain way or spending public money on an improved emergency communication system does not confer clear benefits immediately upon completion, but only when an earthquake occurs -- and that occurrence may be a long time in coming. There is a strong probability that most of those individuals in public office today will not be required to respond officially to an earthquake.

For several reasons, the seismic safety issue itself is imbued with a fatalism that makes it less tractable. First, significant earthquakes have a relatively low probability of occurrence. Second, the event itself cannot be prevented no matter what policy is adopted and implemented. Third, despite recent advances in understanding the precursors of an earthquake, it is not possible to make accurate and highly probable predictions of the time, location, and magnitude of a temblor.[37] When taken together, these simple realities encourage some fatalism about efforts to mitigate the effects of earthquakes through public policy actions.

While their development of the tractability concept is important and useful, we take issue with Sabatier and

Mazmanian when they advance the hypothesis that

> the smaller and more definable (isolatable) the target group whose behavior needs to be changed, the more likely that political support can be mobilized in favor of the program and thus the more probable that the statutory objectives can be achieved.[38]

This formulation, however, ignores the important role that "intensity" plays in mobilizing minorities (even small ones) into political action groups. A challenge to a deeply held value or major economic interest can generate intense attitudes that fuel political activity. What is especially important in this discussion of tractability is that on some types of issues small and intense minorities can have a significant impact on policy and policy implementation. The less general public interest and involvement on an issue, the more likely an intense minority can influence government. Seismic safety is one such issue, and the minority who typically becomes involved is not usually sympathetic with seismic safety policy goals. Thus, the tractability is reduced.

The tractability of seismic safety problems is further reduced by the way in which the costs and benefits of policy implementation are usually arranged. Implementation of seismic safety regulatory policies in the areas of land use and building code enforcement create costs borne by a specific target group such as the building owner or land developer. The benefits, however, are spread in a diffuse manner to all those individuals, for example, who may happen to be in or around a building that would have otherwise collapsed in an earthquake, absent successful implementation of seismic safety policy.[39] The affected minority -- building owners or developers who will bear the initial costs -- is clearly identified and its predictable opposition illustrates the relative intractability of the issue.

Another important aspect of seismic safety can be seen in Charles O. Jones' comment that some public issues do not have a "public." Jones makes this distinction:

> We can distinguish between public problems with a public and those without. In the first the problem is characterized by a group of concerned and organized citizens who intend to get action. The second is acknowledged as a problem which cannot be solved privately but which lacks that supportive element a public can bring.[40]

Arnold J. Meltsner applies Jones' distinction to seismic safety policy when he writes that "the area of seismic safety policy is a public problem without much of a public."[41] The absence of a supportive, active, and organized public makes a difference for the way in which government perceives and considers seismic safety.

The characterization of seismic safety as a public issue without a public should not be interpreted as suggesting that literally no one cares about public action on the issue. Rather, seismic safety is an issue on which a limited number of elites participate. Again, this commentary pushes into material treated more fully in subsequent chapters, but an accurate description of the issue is important at the outset. The term "elites" refers, in a non-pejorative way, to those relatively few persons who, because of reputation, wealth, status or position, are community leaders with a significant potential for influencing public policy. A vast body of social science literature presents the various theories, data, and divergent conclusions about the distribution of power in local communities.[42] Although this literature remains split over the existence of a single dominant elite group versus many discrete elite groups, all the research acknowledges the reality of elites with disproportionate potential for influence. Our research was not designed or operationalized to address the range of issues involved in a traditional community power study. While we observe the predominance of elite-type persons in seismic safety policy-making, we cannot comment on the extent to which these very same people influence other policy issues.

One obvious consequence flowing from our characterization of seismic safety policy should be a difficulty in placing seismic safety squarely on the agenda for official government consideration and deliberation -- that is, a difficulty in moving to Phase Two of the decision-making process. To the extent that seismic safety becomes an agenda item and action is taken which requires implementation, there should be a relatively low level commitment of resources during the implementation phase. Similar propositions could be advanced, but the point should be clear: when we study seismic safety policy-making by local governments in California, the "low frequency of occurrence but potential for a significant calamity" syndrome will undoubtedly affect the objects of our research. Our subsequent analysis is sensitive to this point.

Outline of the Report

Having presented our research topic and the conceptual frameworks within which we have chosen to organize our data and observations, we can now tender a brief outline showing the way in which the remainder of this report will be organized. The next chapter is devoted to an elaboration of the methodology we have employed. In Chapter 2 we detail our choice of jurisdictions to study and our approach to data collection and analysis. Chapter 3 considers the nature of seismic safety as a public issue by focusing on the agenda status and perceptions about seismic safety, the kind of seismic safety proposals that emerge in the research jurisdictions, and the impact of the community's prior experience with earthquakes.

Chapters 4, 5, and 6 will discuss land use planning, building codes, and emergency planning in that order. Each chapter will discuss and analyze what the various jurisdictions have adopted as policy and their implementation efforts. The concluding chapter discusses seismic safety decision-making in the context of efforts to define and apply the concept of acceptable risk. This last chapter also considers the conditions that facilitate the adoption and implementation of seismic safety policy in local communities.

CHAPTER 1

Footnotes

[1] Support for this and the other assertions made in this paragraph comes from Gilbert F. White and J. Eugene Haas, _Assessment of Research on Natural Hazards_. Cambridge: MIT Press, 1975.

[2] Chapter 2 is devoted to a full presentation of our methodology.

[3] Ayre, Robert S. _Earthquakes and Tsurami Hazards in the United States_. Boulder, Colorado, 1975, p. 27.

[4] _Ibid_. All figures in this paragraph come from Ayre. Chapter 2 contains a map of the seismic zones.

[5] National Oceanic and Atmospheric Administration, U.S. Department of Commerce, _A Study of Earthquake Losses in the Los Angeles, California Area_. Washington D.C.: U.S. Government Printing Office, 1973; National Oceanic and Atmospheric Administration, U.S. Department of Commerce, _A Study of Earthquake Losses in the San Francisco Bay Area_. Washington D.C.: U.S. Government Printing Office, 1972.

[6] Bruce A. Bolt and Richard H. Jahns, "California's Earthquake Hazard: A Reassessment," _Public Affairs Report_, Institute of Governmental Studies, University of California, Berkeley, Vol. 20, August 1979, p. 2

[7] We are quite aware of the broad literature on disasters that has appeared since WWII. Not mentioning most of this research should not be interpreted as either ignorance on our part or as a critical evaluation of this research. We have simply selected a few recent studies to highlight points we find important and/or useful in our research.

[8] William A. Anderson, _Disaster and Organizational Change_. Columbus: Disaster Research Center, Ohio State University, 1969.

[9] _Ibid_., p. 82

[10] _Ibid_., p. 83.

[11] White and Haas, _op. cit_.

[12] *Ibid.*, p. 5.

[13] H. Paul Friesma, James Caporaso, Gerald Goldstein, Robert Lineberry, and Richard McCleary, *Aftermath: Communities After Natural Disaster*. Beverley Hills: Sage Publications, 1979.

[14] *Ibid.*, p. 106

[15] *Ibid.*, p. 177.

[16] James D. Wright, Peter H. Rossi, Sonia Wright, and Eleanor Weber-Burdin, *After the Clean-Up: Long-Range Effects of Natural Disasters*. Beverley Hills: Sage Publications, 1979.

[17] *Ibid.*, p. 47.

[18] *Ibid.*, p. 24. Because the authors chose to examine the consequences of only one earthquake, they presented the data on it as a separate case study; the authors are candid in their acknowledgment that generalization from their research on floods, tornadoes and hurricanes to other natural disasters must be approached with some care.

[19] *Ibid.*, p. 24.

[20] William Spangle and Associates, *Land Use Planning After Earthquakes*. Portola Valley, California, 1980.

[21] F. Glen Abney and Larry B. Hall, "Natural Disasters as a Political Variable," *American Political Science Review*, LX, (December, 1966), pp. 974-981.

[22] *Ibid*, p. 980.

[23] Ralph Turner, Joanne Nigg, Denise Heller Pax, and Barbara Shaw Young, *Community Response to Earthquake Threat in Southern California*, Part One. University of California, Los Angeles: Institute for Social Science Research, 1980, p. 235.

[24] Demetrios Caroley, *City Governments and Urban Problems*. Englewood Cliffs: Prentice-Hall, 1977, especially pp. 30-35. The author does not portray his model graphically, but he discusses it extensively in the text.

[25] Douglas Yates, "Urban Government as a Policy-Making System," in L. Masotti and R. Lineberry, *The New Urban Politics*. Cambridge: Ballinger Publishing, 1976, p. 244.

[26] Anthony Downs, Inside Bureaucracy. Boston: Little Brown, 1967, pp. 191-195.

[27] Caroley, op. cit., p. 33.

[28] Roger W. Cobb and Charles D. Elder, Participation in American Politics: The Dynamics of Agenda Building. Boston: Allyn and Bacon, 1972, p. 86.

[29] George Edwards and Ira Sharkansky, The Policy Predicament. San Francisco: W.H. Freeman and Co., 1978, pp. 100 and 101.

[30] Robert Nakamura and Frank Smallwood, The Politics of Policy Implementation. New York: St. Martin's Press, 1980, p. 1.

[31] The seminal work on implementation is by Jeffrey Pressman and Aaron Wildavsky, Implementation. Berkeley: University of California Press, 1974.

[32] Grover Starling, Managing the Public Sector. Homewood, Ill.: Dorsey Press, 1977, p. 228.

[33] Donald S. Van Meter and Carl E. Van Horn, "The Policy Implementation Process; A Conceptual Framework," Administration and Society, 6 (February, 1975), p. 462. For a mild criticism of Van Meter and Van Horn, see Paul Sabatier and Daniel Mazmanian, The Implementation of Regulatory Policy: A Framework of Analysis. Davis: Institute of Governmental Affairs, University of California, Davis, 1979.

[34] Any good public administration textbook provides ample evidence on the difficulty elected officials have in securing the compliance and cooperation of bureaucrats. See, for example, Nicholas Henry, Public Administration and Public Affairs. Englewood Cliffs: Prentice Hall, 1980, or Samuel Bernstein and Patrick O'Hara, Public Administration. New York: Harper and Row, 1979.

[35] Paul Sabatier and Daniel Mazmanian, "The Implementation of Public Policy: A Framework of Analysis," in Implementation. Lexington: D.C. Heath and Co., 1981, pp. 3-35.

[36] Ibid., p. 6.

[37] Most seismologists say that there will probably be a significant earthquake on the San Andreas fault before this century is over. This type of prediction, however, has not had much policy relevance in the local governments of California.

[38] Sabatier and Mazmanian, op. cit., pp. 8-9. The authors indicate other aspects of tractability in addition to this one.

[39] James Q. Wilson refers to this as a case of "distributed benefits and concentrated costs." See James Q. Wilson, Political Organizations. New York: Basic Books, 1973, pp. 334-335.

[40] Charles O. Jones An Introduction to the Study of Public Policy, 2nd Edition. Belmont: Duxbury Press, 1977, p. 17.

[41] Arnold J. Meltsner, "Public Support for Seismic Safety: Where Is It in California?" Mass Emergencies, 3 (1978), p. 167.

[42] The two classic pieces of literature in this field are Floyd Hunter, Community Power Structure, Chapel Hill: University of North Carolina Press, 1953, and Robert Dahl, Who Governs?, New Haven: Yale University Press, 1961. Hunter and Dahl have inspired a large body of subsequent research. For a good collection of many different viewpoints see Willis D. Hawley and Frederick M. Wirt, (eds.), The Search for Community Power, Englewood Cliffs: Prentice-Hall, 1974.

CHAPTER TWO

Methodology

Introduction

The data supporting the analysis in this report are drawn from a study of thirteen communities in the state of California. The individual communities and manner in which they have dealt with seismic safety policy become the "cases" examined in this research.

The Case Study Approach

Among social scientists the case study approach to social phenomena is controversial. It clearly has utility, but it has some significant limitations as well.

In the largest sense, all social science is based on a case approach, in that each phenomenon that is analyzed -- and sometimes counted -- is a "case", an instance, or an example of social action or interaction that fits within given categories of analysis. Each act of voting, each instance of a purchase of a house, each conviction for a crime becomes a "case" or a statistic that is gathered by some investigator for political, economic, or social analysis.

The usual goal of the social science investigator is to aggregate these "cases" into large numbers and to relate them to other social phenomena such as motives, education, income levels, exposure to communications, etc., in order to understand any behavioral patterns that may exist. Where the data are appropriate, demonstration of a statistical relationship can indicate the direction, character, and extent of interaction between variables. Sophisticated statistical manipulation can sometimes point to cause and effect relationships. Other kinds of cases share some characteristics with the events and phenomena described above, but have different purposes and therefore their own utilities. There are cases that describe in narrative detail the events, influences, motives, and perspectives that led to certain kinds of decisions.[1] These cases usually present a detailed story of events, actions, attitudes and concerns, processes, decisions, and outcomes. Cases of this kind have been used extensively in schools of business administration and public administration. While dealing with certain categories of operations or activities -- financial management, personnel decisions, supervision, structure or organization -- they are seldom guided by sufficiently sophisticated theory or bolstered by sufficient empirical evidence to lead to conclusions that are generalizable beyond the specific case at hand. Rather, they are designed to sensitize the reader or observer to the multiple factors and influences that are present in a given decision-making situation, to provide insight into differing perspectives, and to examine extreme events as well as routine situations.

Somewhere in between are the cases which comprise the backbone of data for this volume. The cases included in this study are neither the highly detailed instances of behavior nor the parsimonious statements of statistical relationships that form the body of evidence for the "scientific" study of social behavior. Neither are they "simply" narratives of actors and events and decisions interacting to tell a story leading to certain outcomes. Yet they partake of each.

Basically, the cases in this study are instances or examples of political processes as they dealt with the issue of seismic safety policy. While the discussion often has an evolutionary character, they are clearly not narratives of a series of events. They are more like a series of snapshots that make up a composite picture showing the various elements that have gone into the process of seismic safety policy-making. The snapshots reveal certain events, such as the passage of ordinances; certain perspectives provided by the various participants or observers; certain studies that manifest the nature of the seismic safety problem and alternatives for dealing with it.

The composite pictures provided by these cases display nuance and detail: specific ordering of events, personalities, economic constraints, and political processes. This is one of their great virtues. They sensitize the reader to the complexity of policy-making, the responsiveness or lack of it to specifics -- events, personalities, and economic and political opportunities and hindrances -- that explain outcomes. They provide insights into the perspectives and outlooks of the participants and their explanations of why things are as they are.

The selection of the research communities (our cases) was done with an eye toward making them representative of the various kinds of political, economic, and social settings in which seismic safety policy is made in California. But choosing communities "with an eye" toward representativeness is far from achieving that goal. Using any set of demographic, economic, social or political variables leads to sets of communities that are not always totally compatible in terms of consistent categories. We can only assert that the cases we have selected are roughly representative along a range of dimensions -- immediacy of the seismic event, size of community, character of the population, seriousness of risk -- but they do not purport to represent in any statistical sense the entire universe of cases -- in this instance communities -- in which seismic safety policy-making takes place.

Wright, et al., express concern about the utility of case studies because of their own uniqueness and because the relatively small number of cases included in any study that relies on them "are not sufficient to disentangle the many empirical relationships that can be expected to condition a community's disaster response."[2] Moreover, their uniqueness makes generalization difficult.

We have no objection to those observations; they are correct and make us aware of the limitations under which we operate. Our cases, however, are not designed to rely on aggregate data susceptible to statistical analysis. Our purpose is to look within political and social structures of communities to discover the processes and internal dynamics that lead to certain policy outcomes. While others may discover some relationship between some aggregate variables -- levels of education or percentage of individuals working in heavy industry -- and policy, we seek to determine how individuals interact and how they perceive their own roles and the roles of others in the process of making policy decisions. Our goal is to understand how individual actors perceive objective facts such as earthquakes or threats of earthquakes and actual and potential losses from earthquakes, as factors to be considered in seismic policy-making. It is difficult, if not impossible, at this stage of the game to achieve these goals through aggregate analysis. Given enough resources, of course, it could be done, but it is difficult to imagine the resources that would be required to do so at the depth to which we were able to go in this study.

In most social science research there is also a caveat which states in some form: all other things being equal or *ceteris paribus*. Unfortunately for researchers, all other things are not always equal. There are usually exogenous or intervening variables that may alter the nature of the posited relationships or provide an alternative explanation. Careful investigators are both aware of this possibility and endeavor to account for these less understood influences in their analytic framework. One always hopes that the major causative agents are included in the analysis, that whatever is not included remains trivial. Research relying upon statistical analysis must be as sensitive to this as research consisting of descriptive analysis. Any research such as ours that utilizes an explicit case study approach must be alert to the full range of potential data, relationships, and explanations.

Finally, case studies such as those relied upon in this study are extremely useful for the purpose of hypothesis generation. Carefully done case studies may invalidate certain hypotheses by demonstrating their falsity in the specific situations covered by the cases. The cases may suggest other linkages, new approaches, alternative explanations that become worthy guides for subsequent investigations. It is our conviction that the findings of this study will provide a firmer base for understanding political relationships (and their economic and social foundations) and the impact they have on seismic safety policy. These understandings may provide the foundation for further empirical investigations.

Criteria for Selection of Research Jurisdictions

Local units of government -- cities and counties -- have principal responsibility for policy-making with respect to the crucial instruments for dealing with earthquakes: land use planning, building codes, and emergency response operations. As subordinate units of state government, they are of course influenced and often subject to dictation by the state legislature in the form of legislative mandates and to state agencies in the form of regulations. For instance, the state requires the preparation of a Seismic Safety Element in local government's general plans and every local government is required to adopt the latest version of the Uniform Building Code or its equivalent. Nevertheless, the local units retain considerable discretion with respect to the manner in which they can perform these mandates' responsibilities.

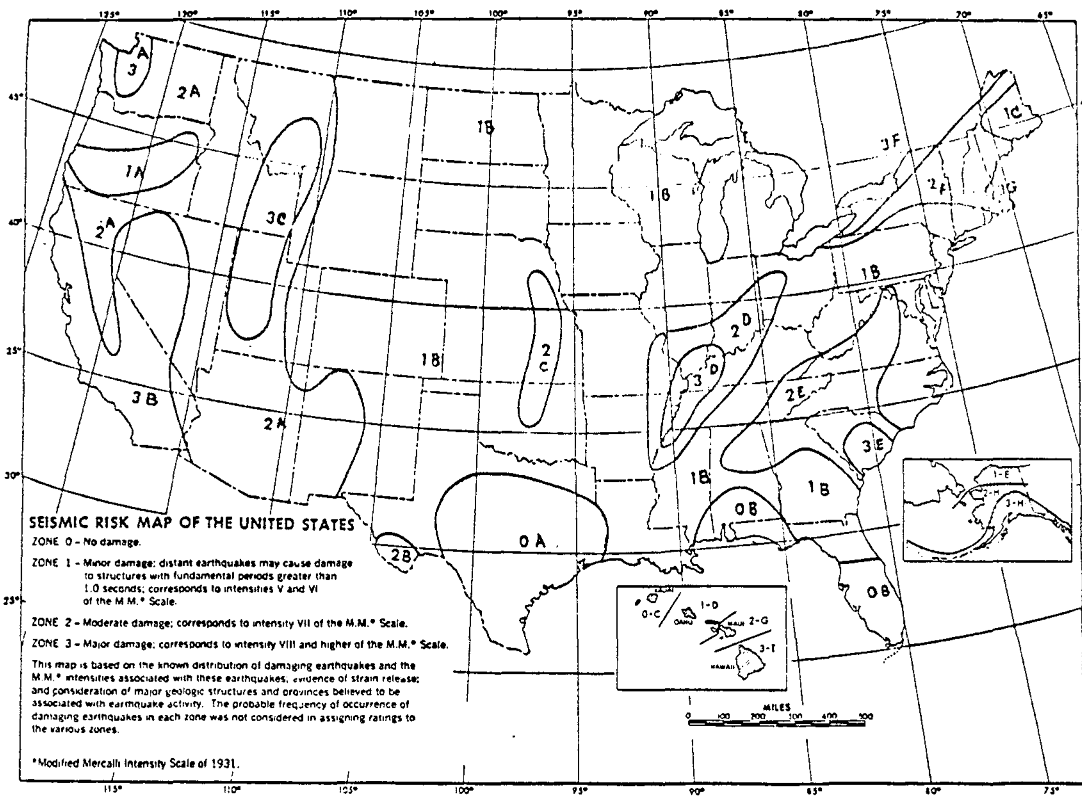
Because of the crucial role they play in seismic safety policy, local governments are the focus of this investigation. An understanding of how local governments deal with seismic risk provides insights into the set of social forces that influence policy and indicates the constraints on and the opportunities for effective policy. Other units of government such as the federal government and the state of California play important and substantial roles, but their influence is largely funneled through and channeled by the local governments.

Given limited resources, and given the strategy of investigating in depth a number of jurisdictions rather than examining somewhat superficially all jurisdictions, it was necessary to select a sample of cities and counties from the total number in California. In selecting the sample, a number of assumptions were operative:

1. Only jurisdictions within the most seismically active areas in California should be included in the sample. The level of seismic risk for given areas varies with the agency doing the classification and with criteria used for inclusion within various classes of risk. For example, the federal Office of Emergency Preparedness placed nearly all of California in Class 3, which meant that those areas were subject to major damage corresponding to intensity VIII on the Modified Mercalli scale. (See Figure 2-1.) Adoption of that classification would have made virtually every jurisdiction except those in the Central Valley of California eligible for the sample.

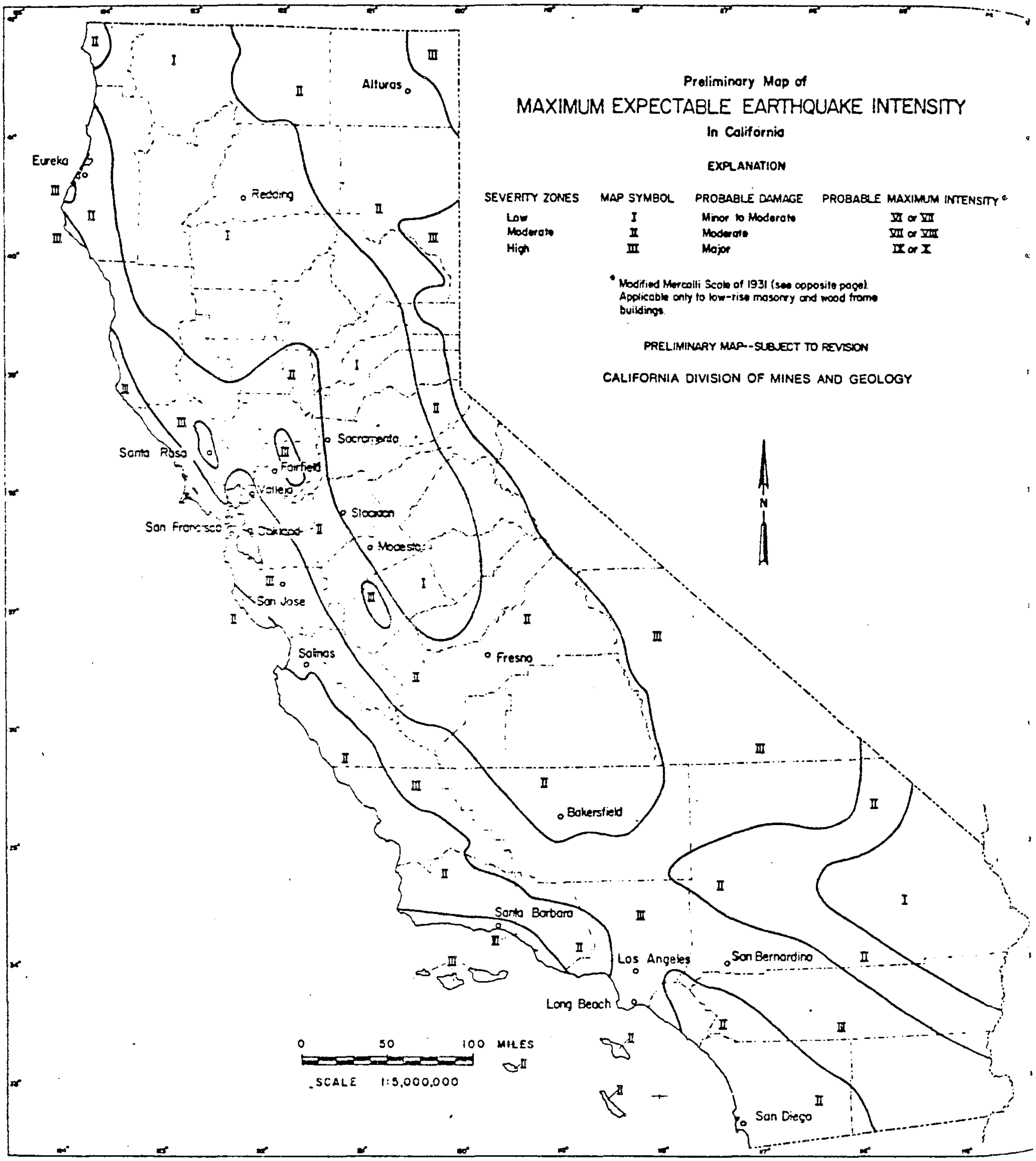
A more refined classification was provided by the California Division of Mines and Geology, placing only limited areas of the state in the class subject to major damage. In general, the high risk areas followed the San Andreas fault,

Figure 2-1: Seismic Risk Map of the United States



Source: Office of Emergency Preparedness, <u>Disaster Preparedness</u>, Vol. 1, Executive Office of the President, Washington: U.S. Government Printing Office as found in Robert S. Ayre, <u>Earthquake and Tsunami Hazards in the United States</u>. Boulder: Institute of Behavioral Science, University of Colorado, 1975, p. 7.

Figure 2-2: Maximum Expectable Earthquake Intensity



Source: California Division of Mines and Geology, Bulletin 198, 1973 as found in Douglas E. Moran, et al., (eds.), Geology, Seismicity, and Environmental Impact. Los Angeles: Association of Engineering Geologists, 1973, p. 346.

but encompassing other fault systems along the south coast of Santa Barbara and Ventura Counties, the area along the eastern side of the Sierra Nevada range, the Los Angeles basin, a section of Riverside County and virtually all of Imperial County. (See Figure 2-2.) Only jurisdictions in Class 3 were included in the universe from which our sample was selected. As indicated, these jurisdictions are subject to risk associated with the intensities IX and X on the Modified Mercalli scale.

2. Jurisdictions would be chosen on the basis of whether or not they had had a severe earthquake experience in the recent past. The basic thrust of the research effort was to discover the conditions and the forces within each community facilitating adoption of more effective seismic safety measures. It was presumed that an actual significant earthquake event would provide an extraordinarily strong impetus in the direction of more effective policy while the absence of such an event would make the adoption of effective policies less likely. There was also an assumption that those jurisdictions on the periphery of a large event, and therefore suffering minor or only moderate damage, would gain insight into the effects of a significant event and therefore be more inclined toward the adoption of seismic safety measures.

This distinction between those jurisdictions having recent experience, not having it, and being on the periphery of an event provided important guidance in the selection. Given the fact that the number of significant earthquake events in the recent past in California was relatively small in number, and given the necessity of recapturing experience from documents and individuals who went through the event and the actions taken subsequently, relatively few jurisdictions qualified for those with recent experience. The 1969 Santa Rosa earthquake and the 1971 San Fernando earthquakes were the two most recent damaging events. The selection of those not having a recent event proved substantially more difficult.

3. The selected jurisdictions would include some in major metropolitan areas and some in relatively smaller, free-standing communities. This criterion was based on the assumption that there might be fundamentally different processes at work in grappling with seismic events or their threat in communities of varying size and complexity. Cities and counties in major metropolitan areas have a vast array of resources on which to draw in dealing with seismic threat. They often have a higher tax base, the array of skills necessary to prepare seismic safety plans is available, and the densities of metropolitan living may make the threat more obvious and may make it appear more dire. Through mutual aid agreements, it may be expected that cities and county government can plan for reciprocal assistance in the event of a major disaster. Their decision-

making structures may be complex and reflect the manifold forces present in such a variegated setting. On the other hand, densely settled cities and counties may have more severe social and economic problems and these may compete for attention with seismic events, whose likelihood of occurring may seem low indeed.

Smaller jurisdictions that are isolated from large metropolitan areas may exhibit other unique characteristics. Their resources may be less than those in major metropolitan areas. The concept of mutual aid may have a different meaning because of the distances between jurisdictions. It is possible that smaller and more rural oriented communities may have different attitudes about the "proper" role of government in general and specifically with respect to natural hazards such as earthquakes. The kinds of issues that attract attention and public debate may not be the same kinds as in metropolitan areas. The decision-making process may be characterized by a structure different from that prevailing in larger and more complex political and economic systems.

In selecting cities, these considerations remained little more than speculation, but they were nevertheless operative guidelines in the process. Fortunately, the two areas with recent earthquake experience -- Santa Rosa and the San Fernando Valley -- neatly fit our criteria. And they were the only two earthquakes of sufficient recency to justify the effort to examine the political responses of the jurisdictions involved. The more difficult task was to select another metropolitan area and another free-standing smaller city for comparison purposes.

4. The final criterion for selection involved the geographic characteristics of the communities within the jurisdictions eligible for selection. The incidence of earthquake events having dictated the selection of the San Fernando Valley and jurisdictions within it and Santa Rosa, the principal task was to discover areas having similar characteristics and having the same level of risk as the San Fernando Valley and Santa Rosa.

The selection of Alameda County with its major city, Oakland, was relatively simple, given the characteristics of two alternative locations: San Francisco and San Diego. San Francisco was eliminated for one principal reason: although it had not had an earthquake for over seven decades, it was and is the prime example of the devastation that an earthquake can wreak. The very uniqueness of San Francisco in the public mind as an "earthquake city" made it less suitable for this study as a place to test propositions about the propensity -- of lack of it -- to engage in seismic mitigation activity, particularly as a jurisdiction that had not recently experienced a major earthquake. The severity of the 1906 earthquake and subsequent fire, in a sense, made it very "recent." This identification of San

Francisco with earthquakes in no way suggests that decision-makers there have taken more seriously the obligation to protect the public safety than other jurisdictions; in fact, there is some evidence to the contrary.[3]

The second alternative was the San Diego metropolitan area. In many respects, San Diego would have made a suitable comparison metropolitan area, especially in terms of demographic characteristics. There are two faults in the immediate San Diego metropolitan area, but there is controversy over whether they are active faults or not. These faults have not produced a major earthquake in 200 years, but there are those who argue that the build-up of tectonic pressure bodes ill for the area in the future.[4] Of principal importance in excluding San Diego from the sample was the fact that San Diego lies in zone II with respect to the maximum expectable earthquake intensity; zone II areas are likely to have earthquakes of moderate intensity with only moderate damage. (See Figure 2-2.) The second but less compelling reason for excluding San Diego was its location in Southern California. To examine the extent of concern for seismic safety among local jurisdictions in the state, it was felt desirable to include a metropolitan area from the northern part of the state.

There was similar difficulty in selecting a smaller free-standing community without recent experience with a damaging earthquake. There were several candidates for inclusion: Vallejo, San Luis Obispo, Salinas, Santa Barbara, and Ventura. Vallejo was eliminated because of its proximity to Santa Rosa and to the San Francisco and East Bay metropolitan areas. Santa Barbara and Ventura were excluded because their inclusion might place too much emphasis on the approach of southern jurisdictions to seismic safety. Ultimately, the choice was between Salinas and San Luis Obispo. The latter was eliminated, in large part, because it lay in zone II with expectations of earthquakes of moderate intensity and moderate damage. Salinas, on the other hand, was clearly in zone III and therefore subject to major events. Although it had suffered severe damage as part of the 1906 San Francisco earthquake, its actual experience was not sufficiently recent to imprint the event indelibly on the minds of its citizens or its decision-makers.

5. Another consideration that played a role in the selection of communities was whether there would be anything noteworthy or of interest to report in a given jurisdiction. While it might be useful to report zero interest or activity in a given city or county government, that report would provide little information regarding the processes of arriving at the condition. Thus, a minimal or threshold level of activity or interest seemed justified as a criterion for selection. In this regard, it should be noted that in the two principal alternatives to our final selections -- San

Diego and San Luis Obispo -- the level of concern was modest to the point of vanishing, making any results obtained from those jurisdictions of minimal interest to those interested in seismic safety planning and mitigation efforts.

A Qualitative Approach

The number of cases included in the sample are two few for statistically valid conclusions. Moreover, the characteristics of the communities are so many and diverse and are so apparently unsystematically related to each other, that an effort to obtain statistically valid conclusions seemed inappropriate.

This demurrer does not mean that no attempt was made at comparisons among jurisdictions and evaluations of the reasons or the forces at work in various communities in fashioning seismic safety policy. Indeed, such explanations and evaluations lie at the heart of this research. Through careful analysis of historical evolutions, the empirical evidence, and the testimony of participants, it is hoped that an accurate explanation for seismic safety policy in each jurisdiction has been derived. Based on that careful assessment, we have endeavored to explain the factors that were generally propitious and those that were less so for effective seismic safety policy across jurisdictions. Only with such conclusions is it possible to arrive at recommendations for strategies and policies that will accomplish the purpose of protecting the public against the destructive power of earthquakes.

The analysis, then, is qualitative in nature. It involves careful scrutiny of the policy-making process in each jurisdiction, the manifold forces at work in each community, the specific circumstances that constrain policy-making and policy-makers, the roles of individuals and groups and the interrelationship of all of these historical, physical, social, and individual factors in order to provide explanations that appear reasonable and justifiable.

THE JURISDICTIONS SELECTED

The final result of winnowing out those jurisdictions that would not suitably satisfy the purposes of this investigation was the selection of the following jurisdictions for in-depth investigation and analysis.

Jurisdictions having had recent earthquake experience	Jurisdictions without recent earthquake experience
Los Angeles County	Alameda County
Cities of: Burbank	Cities of: Berkeley
Glendale	Fremont
Los Angeles	Hayward
San Fernando	Oakland
Simi Valley	
Santa Rosa	Salinas

The jurisdictions most severly affected by a recent earthquake were San Fernando, the city and county of Los Angeles, and Santa Rosa. The other cities in Los Angeles County were included because of their proximity to the center of earthquake damage in the city of San Fernando, the limited actual damage that actually occurred within those cities, and the meaning that such earthquake experience might have for the citizenry and decision-makers in preparing for similar events that might have more severe consequences within their boundaries.

The 1971 earthquake in the San Fernando Valley was the most severe California earthquake in a major metropolitan area since the 1906 earthquake in San Francisco. It registered 6.6 on the Richter scale and its intensity was estimated between VIII and XI on the Modified Mercalli Scale. A total of 58 persons died directly from the earthquake and property damage was estimated at $553 million.[5] The earthquake caused a large earthslide on the inner face of the Lower Van Norman Dam, threatening its collapse and leading to the evacuation of 80,000 residents below the dam. Local authorities were able to handle the emergency aspects of the earthquake without undue stress, but the federal government provided major financial assistance to public agencies and individuals that had suffered significant damage. Moreover, the San Fernando earthquake had a major impact on the scientific community concerned with seismoogy. It was the best instrumented earthquake until that date and scientists learned important lessons, particularly with respect to ground motion and its impact.

Santa Rosa has had both recent and earlier experience with major earthquakes. As a result of the 1906 earthquake along the San Andreas fault, the entire downtown area of Santa Rosa was virtually destroyed. In 1969, an earthquake estimated at 5.6-5.7 on the Richter scale occurred in its vicinity, causing major damage to the downtown area and damage to selected buildings elsewhere. Total damage to buildings and contents was estimated at $6.3 million.[6]

In contrast, despite the highly active seismic character of the geologic structure in Alameda County and the Salinas area, there have not been major earthquakes in those locations in recent decades. The Hayward Fault runs along the base of the mountains on the eastern side of the East Bay area, cutting through the jurisdictions of Berkeley, Oakland, Hayward and Fremont. Despite the proximity of Alameda County to San Francisco, it did not suffer major damage in the 1906 earthquake, although there were instances of structural failure and several deaths. In fact, Oakland provided refuge for many who fled the ravages of the earthquake and fire. Oakland had an earthquake intensity of VII on the Modified Mercalli Scale in 1955 in which there was $1 million damage and the loss of one life. The actual seismic event involved the Calaveras Fault on the other side of the mountains east of Oakland rather than the Hayward Fault. The potentiality for damage from the Hayward Fault was demonstrated in 1868 when an earthquake of an intensity of X struck near Hayward, knocking nearly every house off its foundation, and causing surface rupture that ran for about twenty miles to East Oakland. There was also extensive damage in "fill" areas of the city of San Francisco. Until the 1906 earthquake, the 1868 event in Hayward was identified as the "Great Earthquake." Since that time, however, the East Bay area has suffered relatively minor damage as a result of movement of either the Calaveras or the Hayward Faults.

Salinas suffered major damage from the 1906 earthquake inasmuch as the San Andreas Fault runs to the east of the city. Virtually the entire business district was obliterated, although no lives were lost. Other faults are also located nearby. In the past 170 years, Salinas has experienced six significant tremors, three of them since 1906. The last noticeable tremor was in 1959, but did not cause any damage.

Data Collection

Local Histories

Having selected the jurisdictions for more intensive investigation, the next step was to gather information regarding the history, politics, economic base, and social structure of these communities. We assumed the need to understand the ecological setting of the decision-making process for seismic safety -- essentially the principal activities in which the local population engaged, the political processes in general through which decisions regarding seismic safety would be made, the general values to which the local population subscribed, and the priorities they had with respect to public policy.

For the most part, it was necessary to rely on secondary sources for such data, except for the information available from the census. Given the focus of the study on seismic safety, it was not our purpose to obtain an exhaustive and detailed account of the social processes of each community, but rather enough to allow us to characterize the communities in a general fashion and then to locate the decision-making process and the substantive decisions of each community within that process and within the community's policy-spectrum.

Unfortunately, there is a staggering dearth of literature on the economic structure and social and political processes of most communities. While there is much written about Los Angeles, there is little systematic treatment of most American, and, therefore, most California cities. Even cities as self-conscious about their uniqueness as Berkeley are not the subject of serious treatment. In some instances there are historical "studies" that border on the romantic and provide basic information about the founding and early development of a community, the important early figures, and trends in economic and demographic growth. But little is contemporary, sufficiently broad, or analytical, and, thus, one is dependent on brief snatches of history, cryptic and shorthand characterizations (Oakland is called the "Athens of the West") and pop sociology rather than serious scholarship as a foundation for analysis of seismic safety policy-making.

Fortunately, in some cases there is more reliable information. One notable instance is Oakland (whether or not it is an occidental Athens) which was the subject of detailed investigation by researchers at the University of California, Berkeley. The Oakland Project produced a series of books and monographs that revealed in detail the political and economic processes of that city during the 1960's.[7] While this information was a boon to this project, even such useful information becomes quickly dated and of questionable reliability and validity a decade after it was originally collected.

The consequence of this relatively impoverished informational base was the necessity of relying on data gathered in the census, early histories, and information provided by such organizations as the local Chambers of Commerce. This information was compiled into brief documents that provided us with some rudimentary insights into the character of the cities in which we would be conducting our investigations.

Document Gathering

The next task was to gather information contained in documents regarding seismic safety in each jurisdiction. Such documentary information included the following: Seismic Safety Elements as well as other relevant portions of the general plan; city ordinances; minutes of the meetings of the city councils, boards of supervisors, and planning commissions; planning documents; technical reports such as those on the geology of the region; correspondence; and budgets.

Because of the relatively low level of visibility of the seismic safety issue, information on it tended to be difficult to find. References to seismic safety were encountered only infrequently in the minutes of city councils and planning commissions. Budgets were almost totally unrevealing with regard to seismic safety because they seldom provided detail with respect to programmatic efforts. Special reports tended to be fugitive documents that often could be located only through a very careful combing of voluminous files.

The assistance of the staffs of local governments was crucial in the effort to obtain this documentary information. In some cases, the staff located entire files of materials and allowed the investigators to glean the relevant information. In other cases, the staff members located the relevant documents or provided information regarding the time periods when data might be obtained from such sources as minutes of meetings. We are indebted to the numerous staff people in the selected jurisdictions for their cooperation in making this documentary information available.

The result of this documentary search was the preparation of a lengthy document -- ranging from 25 to 50 pages -- providing both an historical and analytical "case" of seismic safety policy in each jurisdiction. These draft cases then provided the informational base upon which the interview program was undertaken.

Interviews

Once the documentary materials had been gathered and digested through the preparation of a formal report on seismic safety in that jurisdiction, an interview program was undertaken within each jurisdiction. Interview schedules were developed for various categories of respondents, focusing specifically on the perspective that each type of respondent might have on seismic safety. In addition to the questions that were addressed to individuals owing to their specific roles in the community, a number of questions were common to virtually all interview schedules. These tended to emphasize general attitudes toward seismic safety planning in the community. Virtually all of the questions posed to our respondents were open-ended so as to elicit as much information as possible.[8]

The interview schedule provided guidance for the interviewers, but the exact format was not followed in every interview. Interviewers were not always completely faithful to the schedule owing to the usual difficulty in obtaining sufficient time to complete each interview, the obvious priority of some questions over others in terms of the specific information or insights that a given individual might provide, and the tendency for some questions to be answered sufficiently well in a few early interviews, thus obviating the need for continued pursuit of the same information from additional respondents.

A total of 238 interviews were conducted in the 13 jurisdictions. The number of interviews in each jurisdiction ranged from 10 in the city of San Fernando to 40 in the city of Los Angeles. The median number of interviews was 17.

An effort was made to interview the universe of public and private actors potentially having a direct influence on or an interest in seismic safety policy. In the public sector, these actors included members of city councils, mayors, city managers, planning directors and members of planning commissions, public safety officials, heads of public works departments, building code enforcement officials and occasionally engineers, city attorneys, and redevelopment officials. In the private sector, interviews were conducted in most cities with bankers, insurance brokers, architects, real estate officials, Red Cross officers, representatives from the Chambers of Commerce, hospital and school administrators, and occasionally representatives of other organizations such as the League of Women Voters, community associations, land developers and contractors. Table 2-1 indicates the number of interviews held with persons in each kind of position.

The Completed Cases

Upon completion of the interviews, a complete case study was written on seismic safety policy in each jurisdiction. These cases combined the empirical evidence regarding seismic safety policy and the perspectives of participants in the formulation of that policy.

The cases provided the informational base for the analytical chapters in this report. Additional information came from other sources, however. Interviews were conducted, for example, with state officials such as those in the Department of Transportation, the State Architect's Office, and the Seismic Safety Commission. The officials of some special districts also provided data and perspectives on their seismic safety efforts; notable in this regard was

TABLE 2-1:

Frequency Distribution of Respondents

Public Sector		Private Sector	
City Council	35	Insurance	9
Board of Supervisors	6	Banker	14
Mayor	4	Realtor	13
City Manager	9	Chamber of Commerce	7
Staff Assistant to City Manager	5	Contractor/Developer	7
Staff Assistant to Supervisor	1	Red Cross	4
City Attorney	6	Hospital Official	8
Planning Department Staff	19	Business	1
Building Department Staff	13	Architect	8
Planning Commissioner	9	Engineer	6
Emergency Response Planning Staff	16	Misc.	14
School District Superintendent or Staff	7		
Public Works/Engineering Water & Power	11		
Redevelopment Agency Staff	4		
Human Services Department Staff	2		
	147		91

Total Interviewed = 238

the East Bay Municipal Utility District. Some regional officials in both the public and private sectors provided input. Examples are the Southern California Association of Governments, the Hospital Council of Southern California, the Red Cross for Alameda County, and banking officials with regional responsibilities.

Thus, this report relies upon both documentary data and responses from the interviews. This combination of data provides the basis for subsequent chapters.

CHAPTER 2

Footnotes

[1] We exclude from this discussion any references to certain other kinds of cases having proven value within their own specializations, notably law cases, medical clinic cases, and social work cases.

[2] James D. Wright, Peter Rossi, Sonia R. Wright, and Eleanor Weber-Burdin, _After the Clean-Up: Long-Range Effects of Natural Disaster_. Beverly Hills: Sage Publications, 1979, p.47.

[3] It has been estimated that an earthquake of the same magnitude as the 1906 earthquake would impose losses of $13 billion. See Harold C. Cochrane, _et al._, _Social Science Perspectives on the Coming San Francisco Earthquake: Economic Impact, Prediction, and Reconstruction_. Boulder, Colorado: Natural Hazard Research Working Paper #25, Institute of Behavioral Science, University of Colorado, 1974.

[4] Dr. George W. Moore, "San Diego Faces Large Earthquake," _San Diego Union_, September 19, 1979.

[5] Robert S Ayre, _Earthquake and Tsunami Hazards in the United States: A Research Assessment_. Boulder, Colorado: Institute of Behavioral Science, University of Colorado, p. 27.

[6] _Ibid_.

[7] One of the most important works in this project is Jeffrey Pressman and Aaron Wildavsky, _Implementation_. Berkeley: University of California Press, 1973

[8] Any reader interested in seeing the questionnaires may write to the authors, c/o Department of Political Science, University of California, Santa Barbara, California, 93106.

CHAPTER THREE

Seismic Safety as a Public Issue

Seismic safety is an issue of both individual and collective choice. Individuals must examine the possibility of an earthquake inflicting damage or threatening life and weigh the merits of making personal adjustments in light of that threat. At the same time, individuals make up collectivities within communities that face the same threat and must make choices of collective policy for adjusting to it. The choice situations may be related or relatively independent. On the one hand, the individual may perceive either no threat on either the personal or collective level or perceive major threats on both levels. On the other hand, an individual may perceive the threat only in individual terms and ignore or fail to recognize the threat to the community. He may also perceive the threat in reverse -- essentially as a collective and not a personal problem.

It is assumed here that individual perceptions and values play an important part in the decisions that are made by local governments. Thus, the preferences of individuals with respect to the seismic threat may influence in a direct way the extent to which the community decision-makers perceive the seismic threat and the alternative policies they choose in dealing with it. The perceptions of the decision-makers themselves are also crucial variables in the policy-making process.

Nevertheless, it should be recognized that there are significant differences between individual and collective choice processes and the perspectives from which those choices are made.[1] The time horizon for the individual may be far shorter than for the collectivity. The individual may conclude that a recent earthquake event virtually ensures protection against a similar event in his or her lifetime, thus guaranteeing no further loss to that individual. The community, on the other hand, may examine the probability of a hundred or even a five hundred year event as too high and seek a solution that would avoid further devastating loss to the community.

Information is always costly to obtain, but individual decision-making may be hampered to a greater extent by inadequate informational resources as compared to the collectivity. In a highly mobile society, an individual may move from place to place and acquire relatively little information regarding the threatening nature of natural events. On the other hand, the community has institutional capacity to collect information, store it, and retain it for future reference. Moreover, the information may be more systematic and measurable and therefore susceptible to analysis in the light of possible future events and alternative means of mitigating the damage that may be caused. Individuals may rely on supernatural explanations or perceive regularities that may not exist, while collective judgments tend to be rationalized and subjected to professional scrutiny and therefore guided by at least a patina of scientific respectability.

The greater capability of the collectivity to obtain costly information suggests an important role for government in providing information to individual citizens. Public decision-makers may perceive a responsibility to convey information to individuals to enhance their ability to make rational personal choices in their decisions regarding defense against seismic threats. On the other hand, it is clear that there are significant constraints on the government playing that role. For instance, publication of information on seismic dangers can be perceived as threats to property values generally and sometimes as a threat to specific property values in areas where seismic risk is high. Examples of how these constraints function will be found below.

The Distinction Between Collective And Individual Adaption Processes

Burton *et al.*, found four themes that distinguish collective and individual adaptive processes.[2] These themes may be useful in setting the scene for an analysis of the seismic safety agenda of local government decision makers.

(1) The role of crisis. The recency of a disaster appears to play a crucial role in the perception or recognition of a hazard. At the immediate level, disaster relief organizations respond. The communications media demonstrate their awareness through their content. Crises may facilitate the adoption of plans that have already been on the drawing board, but in need of some stimulation to provide momentum. Crises may cause impromptu or untried hazard responses to be built into the routine operations of a community. Visibility of the crisis is particularly important: those farther removed from the crisis are distinctly less stimulated. Over time, however, the sensitivity to the crisis begins to diminish, particularly as other events and public concerns compete for public attention.

(2) Elites, Influentials, and Masses. Collective responses reflect the interactions of individuals who play specialized roles and the broad membership of the collectivity. Political leaders, technical experts, line officials, and the much larger number of community members interact in complex ways, depending on formal and informal channels of communication and the kind and quality of participation allowed each in decision-making situations. The public has expectations with respect to leadership, technical advice, levels of support for programs, and levels of acceptable risks. These expectations in turn materially affect the stance of a given community or sub-community

group with respect to seismic safety.

(3) Competitors and constituencies. In most communities of any size, political agencies and private groups often have overlapping and in some cases competitive jurisdictions. Collective decision-making, therefore, involves the sorting out of responsibilities and the avoidance of egregious gaps in responsibility. These competitive agencies may shape the choices that are offered to constituencies and may vie for, or try to avoid, responsibilities that appear to provide little in the way of political rewards. Seismic safety, for example, may be one of those policy arenas in which sensible politicians seek to avoid responsibility because of the lack of public interest and the positive antipathy of some interested parties for positive action. From their standpoint, sound policy might be to let someone else do it. That someone else might be agencies that are perceived to have greater resources and a sharper sense of the dangers to the community.

(4) Maintenance and change. Community decisions with respect to hazards often impose maintenance costs. They require continuous attention to the social systems that are designed to warn citizens of immenent hazard or to assist them when the hazard becomes a reality. Such costs and attention involve relationships with other hazard activities such as emergency systems that are designed for all hazards. The maintenance of such facilities and social systems often

allows the individual to sense relief of the burden of maintaining private hazard warning or emergency measures. Indeed, individuals may sometimes rely on those structures or social systems when in fact the communities have failed to invest sufficient resources in this policy area.

Public policy must take into consideration the propensity of private decision-makers to ignore or to minimize the dangers or potential damage to their interests from hazardous events. It must also encompass the social risks, the risks that the general public must pay for, whether they are for private damage or damage to public facilities and public institutions. Such public policy may involve, at one end of the spectrum, information disseminated to private individuals regarding private options to protect against earthquake damage. At the other end of the spectrum, it may involve full public assumption of responsibility for damages.

Seismic Safety as a Hidden Issue: Perceptions of Risk

The realization that California is likely to experience earthquakes is probably universal. Either by direct experience or by exposure to motion pictures and other mass media, to drills for evacuation in the event of an earthquake, and to encounters with individuals like real estate salespersons who have to identify houses in "special studies zones", the population is inevitably made aware of the dangers of living in many places in California. Earthquakes are also the subject of humor that is often laced with a serious realization of the threat.

Earthquakes are perhaps the quintessential example of the low probability-high risk event. The likelihood of an earthquake occuring in any given location at any given point in time is very low. The risk of physical harm and loss of property to those who chance to be in the location of a major earthquake at the right time is very high. In this quality, earthquake risk is to be differentiated from more common, widespread, and far more predictable events such as hurricanes and to be compared to other infrequent but high-risk events such as tornadoes.

Human beings learn to live with such risks. In some cases, they engage in rational analysis of their risk situation and endeavor to calculate the costs and benefits associated with subjecting themselves to potential danger. In many other instances, however, there are various psychological mechanisms that come into play that permit them to obscure the risk to which they are subjected. Moreover, as White and Haas point out, the public is far more sensitized and therefore more willing to do something about potential losses from some hazards than from others.[3] They are far more concerned about tornadoes and floods than they are about earthquakes and lightning.

Empirical evidence confirms that accepted utility theory is not applicable to individual decisions with respect to low probability events. Utility theory suggests that individuals prefer to insure themselves against events having a low probability of occurrence but a high loss rather than against those having a high probability and low loss. Far from this being the case, Kunreuther concludes that

> ...if the chances of an event are sufficiently low, people do not even reflect on its consequences. In other words, people are primarily interested in buying insurance [one form of risk mitigation] if they feel the probability of a disaster is high enough for them to stand a good chance of getting a return. They thus view insurance as an <u>investment</u> rather than as protection.[4]

Thus, individuals such as homeowners who reside in hazard-prone areas do not even consider how they will recover from a major hazardous event. Instead, "they treat such events as being so unlikely that they ignore the consequences altogether."[5]

One of the psychological dimensions that appears to play a role is the sense of "voluntariness" associated with the risk.[6] Individuals are willing to accept considerably higher risk -- as much as 1000 times more risk -- in activities in which volition is involved (driving a car, skiing) than they are willing to accept for involuntary conditions to which they are subjected. Even when the benefits of mitigation are equal, they are willing to pay far more to avoid the involuntary risk than those risks they undertake voluntarily.[7] Many natural hazards, including earthquakes, involve considerable elements of voluntariness. Individuals for the most part choose where they live, within their economic means and the location of their employment. The fact that they locate in an earthquake-prone area, then, given the other advantages associated with that location, provides them the sense of choice that perhaps includes acceptance of the risk.[8]

Another important psychological dimension relates to actual experience. Those without actual experience with the hazard are less likely to accept information relating to its probability of occurrence.[9] One would expect those with direct experience to be more sensitive to the risk and more willing to examine policy options, but it does not appear that this is uniformly so. In some instances, where the events are numerous and extreme, as in heavy snowfall areas, there is a tendency to minimize the damage. Those who experience extreme events that come at periodic intervals of several years may be the most sensitive and likely to examine seriously available policy options.

Others have referred to "availability bias." This dimension refers to the perception that an event is likely to be frequent if it is easy to imagine or recall instances of it.[10] More frequent events are usually more readily recalled and likely events are more easily imagined than less likely ones. But estimation of risk may be altered by events that are particularly recent, vivid, and emotionally salient -- as in shark or grizzly bear attacks, or in nuclear accidents. Earthquakes occur sufficiently infrequently, at least of magnitude to cause significant damage, that they are less "available" and less likely to conjure up menacing scenes in the mind.

Another dimension concerns the levels of confidence individuals exhibit regarding their knowledge of risks. There is a tendency to exaggerate knowledge of risk and to make major mistakes in the extent to which one can make sound judgments about the hazards and their occurrence. Moreover, individuals as well as experts are likely to have excessive faith that their estimations are within certain upper and lower bounds of confidence.[11]

Responses to Hazards

Burton, *et al.*, suggest that there are five factors associated with hazards, reflecting prior experience with hazards, the material wealth of the individual, personality traits, the individual's sense of personal efficacy, and his or her relationship to the community and its political structure.[12] These factors in turn are influential with respect to four behavioral patterns that characterize response hazards:

1. Individuals deny the risk, assert that it is not a problem for themselves or their neighbors, and dismiss the

probable consequences of events as not significant.

2. Individuals perceive the risk, but are passive toward it. They conclude there is little they can do about it. They tolerate the prospective losses, but do little to mitigate them.

3. Individuals recognize the hazard and believe they are capable of taking action to mitigate losses. In most cases, the response is in the form of actions upon receipt of warnings. In others, there may be positive action to prevent or mitigate losses.

4. Individuals perceive the potential losses as major in character, are prepared to take preventive action, but at the same time they are prepared to consider drastic changes in location and livelihood.

These responses at the level of the individual do not necessarily correlate with individual expectations regarding the role of government in dealing with the threat of an earthquake. One would assume that those who ignore or are passive toward the risk would similarly dismiss the subject as one not worthy of concern by public officials, although individual passivity does not necessarily preclude acceptance of and reliance on public action as an appropriate community response. Similarly, those who take individual action that they believe has efficacy in terms of the perceived threat might dismiss public action on the grounds that only individual action is called for; on the other hand, those who find individual action appropriate may also find public action an important and necessary complement to their individual efforts. Although our study was not designed to reveal individual responses to earthquake threats, it was designed to provide some insights into the expectations of individual citizens as perceived by public officials and other actors with quasi-public responsibilities.

Seismic Safety as an Issue on the Political Agenda

Issues may intrude upon the political agenda by the very force of an event: a sputnik mobilized the United States into a frantic effort to close the missile gap and to gain leadership in the space race; floods compel attention to the adequacy of levees, water storage or flood plain management; a rise in the crime rate makes physical security a constant concern in an individual's daily life.

But the issue agenda is always crowded. There is always a surfeit of issues seeking attention -- attention that may be measured in time, in intellectual dedication, in money thrown at it, or in mobilizing concern and interest among varied publics. Some issues at the local level are recurrent and pressing, simply because they involve individual lives so intimately and constantly and because they lay claim on so much of the public budget. Public education is probably the most notable example, but others may include traffic congestion and public safety. On the other hand, some issues may lie quietly dormant until some political entrepreneur with sufficient claim on public attention can force it onto the public agenda. The poor were always with us, but little was done about poverty until President Johnson declared a "war on poverty." Civil rights hardly made it onto the political agenda until the Supreme Court pushed it there by its dramatic decision to desegregate the schools in Topeka, Kansas in its landmark decision in Brown vs. Board of Eduction in 1954.

Nor does the fact that an issue gains a priority place on the political agenda guarantee that it will retain that place. Its flanks are always threatened by other issues and sometimes frontal assaults may remove them. Concern for jobs, for example, often threatens to remove the environmental issue from the political agenda. The public may become convinced that an issue has been resolved by some symbolic action that has little to do with the real problem, but much to do with protecting someone's interests. Thus, they are prepared to move on to another issue that captures their fancy.

Issues may also be affected by the economic, social, political, and moral environment in which they are raised. Research on comparative state policy suggests strongly that innovativeness in public policy-making -- the willingness to develop and adopt new programs -- is positively related to a number of factors: level of per capita income, educational levels, degree of urbanization, professionalism in both legislative and executive branches, the levels of participation in policy-making by the electorate and the levels of competition within the political system.[13] The explanations are not necessarily firmly grounded in empirical evidence, but what is available suggests that a wealthy commonwealth can do more, an educated populace is aware of options to existing policy, an organized community is always forcing complex problems and is therefore prepared for and conditioned to change; a professionalized governmental system is competent to prepare policy alternatives that appear relevant to the problem; political parties are vying for support and an active electorate is disposed toward policies and programs that promise solutions.

Given the fact that there is very little public policy anywhere dealing with earthquakes, one would have to class seismic safety by its very nature as innovative. And based on the aggregate of the above factors, one would expect to find California among those states most disposed toward innovative policy. The frequency of earthquakes in California, combined with the above factors tending toward adoption of innovative policy, makes the state the leader of this field. Following the same line of argument, one might expect that innovativeness in policy-making generally, and with respect to seismic safety in particular, might also respond to the same set of social factors.

State Role in Agenda Setting

The state of California plays an important role in placing issues on the agenda of local governments. The state legislature passes legislation in which there is a mandate -- an order -- to local governments that they carry out some task or function. The legislature may prescribe how the task or function is to be carried out, how it is to be financed, whether the state will participate in the financing or administration of the function, and any other feature it may wish to prescribe.

The state has effectively played this role in the field of seismic safety. It has mandated that every unit of local government prepare a Seismic Safety Element as part of its general plan -- which it has also mandated. The legislation fixed a date -- 1974 -- by which time all such elements were to be completed, thus presumably pushing the Seismic Safety Element to a position relatively high on the agenda. The legislation did not prescribe in detail the contents of such an element nor did it establish a qualitative standard, thus allowing each community considerable discretion in its manner of responding to the mandate. Thus, seismic safety made it on to the local agenda, but whether it was susceptible to a superficial response or relegation to some dark recess of the planning department's shelf depended upon choices made by local officials. The receptivity of local public officials and their own sense of urgency about the issue determined seismic safety's actual agenda status.

A more enduring, but not necessarily more influential impact on the local agenda was the consequence of the Alquist-Priolo Special Studies Zone Act.[14] This state law requires the State Geologist to map special studies zones of one-eighth of a mile on either side of four major faults in California (and others later identified as active). Upon receipt of these maps, local governments must then follow criteria established by the state in considering requests for land development within the zones. For instance, no structure intended for human occupancy may be built astride an identified active fault within a special studies zone. Interpretation and enforcement of this Act's mandate rest with local government. Once again, the state has placed an item on the local agenda, but its exact status is determined locally.

At a more automatic level of agenda-setting, the state of California mandated that each city and county adopt the newest edition of the Uniform Building Code or a code equivalent in stringency and professional stature as that code. By ordinance, most cities and counties have simply adopted the updated versions of the Uniform Building Code as they appear. Where there has been any discussion about a new version of the code, it has not been centered on the seismic provisions.

More examples of the state's role in seismic safety agenda-setting could be offered. But they all point to the same conclusion -- the state has mandated considerable action by local governments in the area of seismic safety and typically the mandates permit discretion by the affected local governments.

The Political Agendas in California Cities

A major earthquake immediately places seismic safety on the political agendas of each community in which the event caused significant damage or loss of life. Top priority on the agenda is given to emergency measures to mitigate suffering, to restore services, and to remove dangerous structures. Once these measures have accomplished their purposes, attention then usually turns to activities that can be pursued more gradually: the removal of debris, assistance in the reconstruction of houses, and repair of streets. The final stage, one that might extend indefinitely in time, is the period for consideration of more permanent changes in policy or programs by which to deal with future threats of a seismic nature.

The first two categories of political responses to a major event are largely compelled by the nature of the circumstances: clear and immediate danger to life and property and the need to restore a community to a whole. The third is neither immediate nor compelled by the circumstances. A decision to place and to maintain seismic safety on the political agenda is a political act that requires both political mobilization and technical support.

From only studying thirteen jurisdictions it is impossible to say conclusively why one community places seismic safety higher on the permanent political agenda than another. But some conditions appear to stand out in those communities in which more permanent changes have occurred. The lack of those conditions appears to explain the absence of significant change in others.

Severity of the Problem

The severity of the problem is measured less in terms of the seismic threat -- all of the communities in this research are in high seismic risk areas -- but rather in terms of the number of structures and people who are endangered by seismic activity. It is clear, for example, that Los Angeles has a major problem because of the number of old buildings in the central area of the city. It is estimated that there are about 8,000 buildings that are unsafe, imposing a hazard for the resident and transient population.[15] The potentiality for loss of life and property is staggering in its proportions; so also are the number and size of the lawsuits that might be filed by injured parties if an earthquake caused loss of life and property and if the courts were to conclude that the city had some responsibility for ensuring public safety against such events.

There is no comparable evidence regarding the "size" of the seismic problem in other communities. The city next largest in size in this research -- Oakland -- has conducted no detailed investigation comparable to that in Los Angeles. As an older city one suspects that its problems may be significant, but there appears to be no stimulus for action. Thus, one concludes that the size of the problem may be a predisposing factor but clearly not a sufficient condition. Nor does it appear to be a necessary condition, given the willingness in some cities with less serious problems to place seismic safety higher on the political agenda than in Oakland.

Resources

Resources may be defined broadly to include the technical staffs and the financial and human base necessary to undertake a thorough study of the seismic safety problem. Sufficient political support that seismic safety will not be dismissed because of opposition is also a resource.

Perhaps the most important resource is staff time, interest, and capability. Some of the communities in this survey are relatively small and without a wide range of technical competence to undertake any serious study related to seismic safety. It is for this reason that some of them essentially "farmed out" the Seismic Safety Element to a consulting firm and were satisfied with what appears to be a relatively stock product. (See Chapter 4.) Burdened by the routine matters of processing building applications and zoning matters, they are not prepared to take on a study that requires considerable technical expertise and time. They are additionally not in a favorable position to evaluate more generalized information prepared by other technical experts who are knowledgeable in this area: engineers, geologists, seismologists, survey researchers, etc. Voluminous and learned reports are received and filed, but may not be carefully examined for their meaning.

Despite the specialization and hierarchical structure in which local government staff must work, it appears there exists considerable opportunity for a staff person who is sensitized to a given issue (by whatever socialization process that leads to such sensitivity) to stir up superiors and ultimately the political leaders of the community. This was evident, for example, in Hayward, where the staff became alert to the possibilities of serious earthquake impacts even before the 1971 San Fernando earthquake, and much more so subsequent to it. Their efforts, along with the efforts of a private citizen, pushed the issue onto the agenda of the city where it still remains. Similarly, but less successfully, a professional staff member in Salinas made the issue an agenda item by his own investigations, ultimately having to accept the fact that the elected decision-makers had no interest in keeping the issue before them.

Relationships with Competing Issues

Concern for seismic safety remains essentially a discretionary issue with most local government, i.e., the top decision-makers can leave the issue alone with political impunity or they can take it up, again with relatively little awareness or response from the electorate. It is at least arguable, however, that decision-makers are less likely to take up the issue when other issues crowd the political agenda. The other issues may not be more momentous or pressing in some abstract sense, but they are simply considered more vital because of the political exigencies of the given community.

Berkeley may be found in that category. The peculiar character of this university city with its deep social and racial divisions and the values of non-conformist students have served to keep other issues on the agenda and to keep seismic safety off because it simply is not salient to enough people. Elected officials have been far more sensitive to issues of growth, human services, traffic control, and drug abuse. Seismic safety cannot compete in such an environment.

Public Attitudes Toward Seismic Safety

Given the wealth of evidence in the literature that the public tends to ignore the low probability, high risk event, it was not surprising to find that public officials in the research jurisdictions perceived very little public concern over seismic safety.[16] Lacking direct evidence from the public itself, we asked both public officials and private individuals with business or professional responsibilities their perceptions of the public's feelings about seismic safety. While not a perfect measure, it does reveal the views of individuals who are most likely to be sensitive to public concern: elected and appointed officials and private persons who are likely to respond to demands for protection from earthquakes in one form or another.

The overwhelming majority of the city council members who were asked about the public's concern over seismic safety responded that it was minimal, low, did not appear among the first ten issues of concern to them, or non-existent. Of the thirty-nine council members or city managers who provided direct answeres, thirty-four (including four city managers) placed seismic safety in this lowest category. Four council members placed it in the moderate category while only one placed public concern as high.

This pattern of response should be examined in proper context. Many of those who placed public concern relatively low observed that there was a high level of consciousness of the risk. They expressed the view that the public knew the risk existed, but were fatalistic about it or believed that the likelihood of their being directly affected was relatively light. It was their feeling that the public had learned to live with earthquake risk; that they had not been seriously affected by earthquakes over the many years of their residence in earthquake-prone areas and reasoned from this fact that they should not be concerned now; and that there was little that could be done to alter the consequences of a major earthquake that might occur. These perceptions correspond closely to one of the typical behavioral responses to hazards discussed by Burton, et al.: individuals perceive a risk, but are passive about it.[17]

Concern for issues, whether private or public policy issues, is, of course, relative. The public is concerned about seismic safety, but such concern is simply overwhelmed by interest in or anxiety over the outcome of other issues. The interviews for this study were undertaken in the period directly after California voters had approved by a vast margin Proposition 13, the so-called "Jarvis" amendment to the California constitution, drastically reducing the levels of property taxes that local governments could impose. Concern for taxes, then, loomed very large in comparison with issues like seismic safety. Elected officials in the California communities reported that local citizens were also much more concerned about pressing and immediate matters such as inflation, employment, growth, and congestion.

A number of respondents observed that the seismic safety issue is likely to arise in the context of other issues that are deemed more pressing. Seismic safety, therefore, becomes more of a weapon than a separate issue. For example, there are many in the earthquake-prone communities in both Northern and Southern California who are anxious to protect from development hillsides adjacent to their homes or existing facilities. They consider the open hillsides an aesthetically pleasing "backdrop" to their communities. When proposals are made to build residential or other developments on the hillsides, the issue of seismic safety is raised as one of a host of issues. (See Chapter 4.) The seismic safety issue may be legitimate (or it may not), but a concern for the possible consequences of an earthquake causing severe damage to structures or loss of life because of hillside development is clearly subsidiary to the more pressing and transcendent concern for aesthetics, perhaps added population, or the need for new schools. One city council member in Berkeley gave an example of a testing laboratory proposed for construction by the University of California at a particular site. Seismic safety was raised as an issue, but the real issue was the appropriateness and the impact of a major structure at that site. Similarly, traffic diverters in the streets of Berkeley were opposed because of a possible need for swift evacuation in case of an earthquake. But the basic issue was transportation, not seismic safety.

Some city officials believed that seismic safety was not an issue of much concern to the public because the public had confidence that this policy matter was safely entrusted to public officials. The public's confidence in the officialdom of the community assertedly made it possible for the public to put seismic safety out of mind and to concentrate on other issues over which they could exercise more individual control.

Another factor that was perceived to explain public apathy toward seismic safety was the large percentage of the population that lived in single-family frame dwellings. These kind of houses are considered relatively safe because they are flexible, i.e., they have a tendency to "give" under stress. It is notable, for example, that no one died in the San Fernando earthquake as the result of structural failure in single-family residences or even in apartments. There was considerable property damage, but much of it was relatively minor -- less than $5,000 -- and did not lead to demolition of the property. The public has confidence in this kind of structure and, therefore, is less prepared to place seismic safety high on the political agenda.

Related to this circumstance is the fact that a large population at serious risk, principally those who reside or work in older unreinforced masonry buildings, are unlikely to be political aware or influential. Residents of an older hotel in a central city area are likely to be poor, old, and politically unsophisticated. They are probably poorly informed concerning the nature of the risk to which they are subjected and would not feel sufficient incentives or have feelings of political efficacy to lead them to take action on the issue.

Public confidence is probably warranted in another respect, that is, with regard to the public schools. Since the Field Act of 1933 schools in California have been built to standards that reflected the most advanced engineering knowledge of structural safety with respect to earthquakes. The public is aware of this fact and is usually prepared to support actions that are necessary to ensure the structural integrity of schools. Since the San Fernando earthquake of 1971, the voters of the state have approved a bond issue to rehabilitate or demolish all those school structures that had not been built to the more stringent codes. Several schools had failed in the San Fernando earthquake, leading the state legislature to put the school bond issue before the voters. In some communities, such as Simi Valley, nearly every public school has been built since 1933 and, therefore, there is less danger in those structure (from seismic activity).

The picture one receives from public officials and local political leaders is of a public that is aware of the earthquake risk, but apathetic with respect to any public policy issues that might logically be derived from knowledge of that risk. Earthquakes are a "given" aspect of life in many parts of California. It is a phenomenon that many have experienced directly, although without damaging consequences. The risk creates uneasiness, but apparently not enough to warrant action.

Evidence Provided by Others

Questions concerning public attitudes toward earthquakes were addressed to a wide range of other community actors: insurance agents, bankers, architects, hospital administrators, and others. Their response was overwhelmingly in the same vein: public apathy and disinterest accompanied by a fatalism regarding its consequences. The issue simply did not find place on the public policy agenda of most citizens, in the opinion of a wide spectrum of community actors.

Because of the relatively small number of elected officials in each community, and the fact that only a portion were available for interview, it is impossible to make inter-community comparisons regarding public perceptions of the seismic safety issue. Nevertheless, it should be noted that there were not significant differences between officials' perceptions of public attitudes in communities recently having experienced a major earthquake and those not having done so. For example, none of the city council members in Santa Rosa or San Fernando placed seismic safety among the important issues for the public in those communities. Those in Burbank and Glendale, on the periphery of the 1971 earthquake had the same perception. The one exception was the city of Los Angeles, where three out of six respondents found public interest either moderate or high. The reason for the assertedly heightened perception in Los Angeles is unclear, although it might be related to the fact that the city was examining the old buildings issue during the course of this research and the public may have been alerted to the issue for that reason.

Unquestionably, seismic safety was a major issue in 1969 in Santa Rosa and in San Fernando and Los Angeles City and County in 1971. The lack of perceived interest -- at least that public concern perceived by public officials -- in 1978 and 1979 when the field work was undertaken suggests that the public interest in the issue dramatically declined with the passage of time. Not having data on public attitudes throughout this period, it is possible only to speculate, but it seems apparent that public concern for a phenomenon that had caused considerable losses in a given community quickly wanes and is pre-empted by other issues.

Perceptions of the Seismic Safety Issue by Public Officials

Members of city councils and city managers were asked about their own perception of the importance of seismic safety to their local governments, the level of effort displayed by local government, and the place that seismic safety occupied in the range of issues with which local government had to deal. Their responses revealed a significant higher estimation of the importance of seismic safety than public concern would appear to warrant and a conviction that in many instances local government was engaging in necessary and valuable activities to deal with seismic risks.

Of the forty-three individuals who provided clear responses to the question of where seismic safety would rank on a scale with respect to the extent of interest displayed by local government, twenty-five found local governmental interest low, but eleven found local government interest to be moderate and seven found it to be high.

The meaning of the above responses requires some elucidation. The explanations offered by various political figures revealed information or knowledge ranging from total ignorance of the efforts of local government to an intimate knowledge of the seismic safety program. New council members, for example, occasionally responded that the issue of seismic safety had never come up on the agenda of a council meeting. Their impression was that the city was doing nothing or next to it. On the other hand, there were those who expressed the same view -- that the issue seldom, if ever, came up -- but who believed that the efforts of the local government were significant and effective in dealing with the problem. For these respondents, the reason the issue never arose was the satisfactory action of local government in dealing with seismic problems. Seismic safety was essentially a staff concern and a staff operation, they asserted, and not one that should occupy the time of elected or even top administrative officials.

Nevertheless, the responses by most city council members and city managers is probably an accurate one: seismic safety does not place high on the political agenda. In some communities where a serious effort has been made to place it on the political agenda, it has been effectively suppressed. This was notably the case in Salinas and Burbank. Staff persons in Salinas and a member of the city council in Burbank tried to make it a major issue and were effectively thwarted by a majority of members of the council. In some communities, no one has tried to put the issue on the agenda because there is a sense of hopelessness in dealing with the issue. This would be particularly true of a community like San Fernando. With relatively limited resources, and with resources declining or threatened by reductions in the city's ability to rely on the property tax, a suggestion that the city government might do more to deal with the seismic safety issue is likely to fall on deaf ears. It is not just a question of financial resources; it is also a question of personnel. In a small community like San Fernando, there are only limited numbers of city personnel, who are spread thinly over many policy issues and problems. They receive (indeed, they are inundated with) lengthy and technical reports from various agencies like the Southern California Association of Governments or various state and regional agencies. These reports would undoubtedly assist the local government in dealing with a variety of problems, but they tend to be filed away, gathering dust because there simply are not enough people with the appropriate skills to digest them and give them some practical applications.

It is clear from the responses of many city council members that they look to the municipal staff for guidance and direction on seismic safety policy. One council member observed, "I leave it to the experts." Another said that seismic safety is an "administrative item" leaving the council free to concentrate on other issues. The city council members and the city manager in another city agreed that seismic safety was not an issue of great moment to the general public, but that the staff did an excellent job of identifying the problem areas, making the appropriate investigations, and recommending action. The council occasionally overruled the staff, but it largely followed staff recommendations or achieved some compromise position.

The perspective of council members and other top administrative officials clearly colors their judgment about the importance of seismic safety in local governmental decisions. In one Northern California community, the majority believed the city to be a leader in seismic safety. They emphasized efforts to limit buildings to stable hillsides, to prohibit development on bay fill and sandy soil underlain with saturated sub-soil, to take great care in the location of thoroughfares, etc. They admitted the failure to take dramatic actions to deal with older buildings that were arguable unsafe, but felt that reasonable compromises had been made in view of the costs and sacrifices that would be entailed in more rapid action. But one council member denounced the council's behavior, charging that any action that threatened all-out development was "against their religion." "When push comes to shove," this council member asserted, no effective action was forthcoming. They simply overrule the staff recommendations in accommodating developmental interests, it was suggested. In another city, a council member observed that "there is much rhetoric; very little action."

Perceptions of Seismic Risk by Political Leaders

It is clear that political leaders have a much higher perception of the seismic risk to which the community is subjected than they perceive to be found among their constituents. Of the thirty-eight elected local officials and city managers who provided usable answers, seventeen considered seismic risk to be high, fourteen found the risk moderate and only seven found it to be low. This stands in sharp contrast with the thirty-four elected local officials who believed that public awareness and sensitivity to the issue was low.

There is, of course, a tendency of those in authority to attribute to themselves a greater awareness of an issue than they might attribute to others who are not on the "inside" of the political system. On the other hand, as members of the official structure of the municipality, it is likely that they are in the flow of communication regarding a wide range of policy issues and that they are prepared to take cognizance of those issues where the public may be less likely to do so. Their actual consideration of projects wherein seismic safety considerations are present provides them an awareness that is unlikely to be found in the general public.

As indicated above, seismic safety may be considered by many elected and top appointive officials to be a "staff" issue in that the lines of communication are most often among technical experts in government agencies, government researchers, professional organizations, and subordinate staff in municipal and county government. The issue surfaces, i.e., comes to the attention of elected officials and city managers, when new information or new perspectives requires renewed consideration of it. The source, then, of heightened concern for seismic safety is likely to be the relevant staff members of local government.

Purchases of Seismic Safety Through Insurance

Public concern for seismic safety may be registered not only through expressions of preferences to elected and administrative officials of local government, but also through the efforts that individuals make privately to insure against loss. Basically, this may be accomplished through insurance on the one major asset that many individuals or families own -- a home.

Interviews were held with insurance agents or brokers in all of the communities under investigation. In most interviews, the insurance agent or broker was asked to indicate an estimate of the extent to which homeowners had purchased earthquake insurance. Thier responses were admittedly guesses, but they were presumably informed guesses about the extent to which homeowners were willing to pay for home protection. Moreover, a single interview in a given community cannot reveal the range of experience within a community. It is conceivable that in a given community one insurance agent may be more aggressive than another in selling a given kind of insurance. The generalizations we present are therefore designed to provide a picture of attitudes toward earthquake insurance generally in California and not in any particular community.

The insurance agents universally believed that earthquake insurance was not a form of coverage of much interest to their clients. In areas where earthquakes had occurred, agents reported that there was a significant upsurge in earthquake insurance business immediately after the earthquake, but that it quickly tailed off as the impact of the earthquake receded into memory. In some instances, the additional insurance during the aftermath of the earthquake remained on the books; in others it was reported that the numbers having such coverage returned to its previous low level.

In general, it would appear that earthquake insurance was far more popular in areas where earthquakes had occurred in the recent past then in areas where they had not. The following are the estimates by insurance agents in each area of the percentage of their clients having earthquake insurance:

Berkeley:	2-5%
Burbank:	2.5%
Fremont:	2%
Glendale:	less than 20%
Hayward:	less than 10%
Salinas:	1%
San Fernando:	40%
San Fernando Valley and Sylmar:	33%
Simi Valley:	20%

The estimates of higher levels of earthquake insurance coverage are all in Southern California, the scene of California's most devastating earthquake since the 1906 San Francisco earthquake. Burbank was an exception in having a low estimated insurance level. Coverage in Northern California, where the only major earthquake in recent times was in Santa Rosa, tended to be very low.

There is a rational explanation for the relative reluctance of homeowners to purchase such insurance coverage. Earthquake insurance is relatively expensive, ranging from \$1.50 to \$2.00 per \$1,000 valuation for residential property. For a home with a valuation of \$100,000 the annual cost is from \$150 t0 \$200. In addition, there is a high deductible amount, often in the neighborhood of \$5,000 for each damaging event. Given the actual experience with earthquakes wherein most damage to homes is considerably less than \$5,000, there is little incentive for the average homeowner to purchase such insurance. With the prospect, whether justified or not, of having the federal government provide emergency funds to those who suffered damage in an earthquake, the incentives to pay for protection are further reduced. Federal assistance is, of course, not guaranteed, but experience has demonstrated that the pressure for such assistance in areas declared national disaster areas becomes intense.

Some insurance agents suggested that interest in earthquake insurance tended to rise among those who had considerable equity in a home. Those with little equity might be able to afford to walk away from a house in the event of a disaster in which the uninsured cost of repair was greater than the value of the individual's investment. Those with greater equity, foreseeing the possibility of major loss, were more inclined to protect their investment through insurance. There are no figures available to demonstrate such a relationship, but a logical argument clearly exists to support this impression.

Insurance agents do not appear to market earthquake insurance aggressively because of its relative lack of appeal to clients. They sell it to the client who requests it. Recognizing its relative unattractiveness to the average homeowners, some have concluded that the industry could be more imaginative in offering this kind of coverage. Some suggested a form of all-purpose hazard coverage that would pool the risk of damage from earthquake with the risk from floods, hurricanes, wind, tornadoes and other hazards except, presumably, fire. It was felt that such insurance would probably be much lower in cost and thus more attractive to many homeowners. But the agents did not perceive any particular movement in that direction from the insurance industry itself.

Buying insurance is a behavioral pattern that responds to the earthquake hazard in a way Burton *et al.*[18] suggested as one of the possible types of responses. Those who buy insurance perceive seismic safety as an important concern in their personal lives, and believe that they can take action to mitigate their losses. Only a small fraction of property owners in our research jurisdictions apparently engage in this type of response to the hazard.

Positive Community Activity and Interest in Seismic Safety

Each city council member or county supervisor was asked about the extent to which he or she had had contacts with individuals or representatives of groups in the community that were concerned with seismic safety. The purpose of the question was to determine the extent to which individuals or group representatives displayed activity that tended to place seismic safety on the political agenda.

Of the thirty-three council members, supervisors or city managers who responded to this question, only eleven indicated that there had been no effort on the part of individuals to influence them or that there was no organized activity in the community to deal with seismic safety. The remaining twenty-two were able to identify either some group or some individuals who had expressed concern, provided expert testimony, or became involved in specific issues or projects that involved seismic safety.

In most cases the contact occurred because of a specific issue or project that evoked some self-interested response on the part of individuals or groups within the community. Los Angeles provides a good example. Los Angeles investigated the old buildings problem in 1978 and 1979 and developed a proposed ordinance to mitigate or abate the problem. Members of the city council heard from a variety of individuals whose active interest was formally requested or whose stake was threatened by the proposed ordinance. Building owners were particularly active, especially the owners of theaters and apartment houses. Members of the council also identified persons associated with the American Institute of Architects and the Structural Engineers Association of Southern California. One council member mentioned representatives of a children's mental health clinic who were interested in the consequences of individual stress associated with earthquakes.

Similarly, in the city of Salinas, the preparation of a Seismic Safety Element that would have identified serious seismic risks to the downtown area of Salinas evoked a major response from the business community. Individual merchants protested, as did the Center City Authority, an advisory committee to the city council on downtown revitalization. This conflict was the subject of a number of newspaper articles concerning the seismic problem.

In at least one case, the prime mover in getting the attention of members of the city council was a private but well-informed individual. This was George Simonds, an architect, a faculty member of the University of California, Berkeley, and a resident of Hayward. After discovering the existence of significant evidence of fault creep on his own property, Simonds undertook a more thorough investigation of the nature of the geologic structure underlying Hayward. He endeavored to educate members of the city council, become what one council member called a "local guru" on seismic safety, and advised them on specific projects.

Also in Hayward, the League of Women Voters became an active force in the consideration of seismic safety matters. The interest in seismic safety was a natural outgrowth of the League's continuing interest in land-use planning both in Hayward and nationally. The League closely monitored the seismic safety program in Hayward, including making contact with various local officials concerning land-use planning and building construction.

Conclusions

In the broadest sense, seismic safety is always on the political agenda in California. Like citizens generally, decision-makers at all levels are aware of the imminence of earthquakes at some time and in some location and of sufficient intensity to threaten life and property. Despite public fatalism and individual judgment that he or she is willing to take the risks associated with living in earthquake country, there is also a general recognition by public officials of their responsibility for preparation for earthquakes and mitigation of their consequences. If decision-makers at the local level did not sense this responsibility on their own, the state of California has mandated concern through its requirements with respect to planning and land use.

Nevertheless, seismic safety occupies a relatively low place on the political agenda. The unpredictability of earthquakes, the sense of having lived with earthquakes without serious consequences for decades and, indeed, entire lifetimes, the significant costs in doing something about earthquake damage mitigation, and the pressing nature of other issues all serve to make seismic safety a less urgent issue. Even a major earthquake event does not necessarily shake a community from its lethargy; rather, there is a sense that a community has now "had" its earthquake and can relax.

The factors that seem to make a difference basically are human in nature. More than any other single factor, one would point to the interest and competence of individuals, particularly at the staff level, who develop an interest in seismic safety and strive to bring it prominently to the attention of decision-makers in the city. They seldom engender public support, but rather demonstrate to the city officials that the issue is an important one, vital to the interests of the citizenry individually and collectively. Having the technical expertise, and some discretionary time, they are in a position to develop policy options that provide viable solutions to the problem. These then become actionable agenda items.

CHAPTER 3

Footnotes

[1] Ian Burton, Robert W. Kates, and Gilbert F. White, The Environment as Hazard. New York: Oxford University Press, 1978, ch. 5.

[2] Ibid., pp. 136-148.

[3] Gilbert F. White and J. Eugenne Haas, Assessment of Research on Natural Hazards. Cambridge: MIT Press, 1975.

[4] Howard Kunreuther, "The Changing Societal Consequences of Risks from Natural Hazards," The Annals of the American Academy of Political and Social Sciences, 443 (May, 1979), p. 112.

[5] Ibid., p. 111.

[6] C. Starr, "Social Benefits Versus Technological Risk," Science, (1969), pp. 1232-1238.

[7] Baruch Fischoff, Paul Slovic, and Sarah Lichtenstein, "Which Risks Are Asseptable?" Environment, (May, 1979), pp. 17-38.

[8] White and Haas, op. cit., p. 88.

[9] Ibid, p. 100.

[10] Paul Slovic and Baruch Fischoff, "How Safe is Safe Enough? Determinants of Perceived and Acceptable Risk," preliminary draft of chapter, January, 1979, to appear in L. Gould and C.A. Walker (eds.), Too Hot to Handle: Social and Policy Issues in the Management of Radioactive Wastes. Forthcoming.

[11] Ibid, pp. 7-8.

[12] Burton, et al., op. cit., pp. 106-110.

[13] Thomas R. Dye, Understanding Public Policy. 4th Ed., Englewood Cliffs, N.J.: Prentice-Hall, 1981, p. 363.

[14] California Public Resources Code, Sections 2621-2630.

[15] Los Angeles Times, January 8, 1981, p. 1, Part II.

[16] The literature on risk taking behavior is voluminous. A few of the important works include: Richard E. Carney, Risk Taking Behavior. Springfield, Illinois: Charles C. Thomas Publisher, 1971; Robert W. Kates, Risk Assessment of Environmental Hazards. New York: John Wiley & Sons, 1977; W. Lowrance, Of Acceptable Risk. Los Altos, California: W. Kaufmann Co., 1976; William D. Rowe, Anatomy of Risk. New York: John Wiley & Sons, 1977; Paul Slovic, Howard Kunreuther, and Gilbert F. White, "Decision Processes, Rationality, and Adjustment to Natural Hazards," in Gilbert F. White (ed.), Natural Hazards: Local, National, and Global. New York: Oxford University Press, 1974, pp. 187-205.

[17] Burton, op. cit.

[18] Ibid.

CHAPTER FOUR

Land Use Planning and Seismic Safety

In previous chapters we have discussed and analyzed the way in which seismic safety is perceived as an issue in local communities. With this understanding we now turn to the important products of the seismic safety decision-making process. We ask the deceptively simple question, "What has been done?" Our attention focuses on the policies and implementation efforts in the areas of land use, building codes, and emergency response planning. In these three areas local governments have major opportunities to address seismic safety. This chapter concentrates upon the land use area, while subsequent chapters will address building codes and emergency response planning. Segregating these three activities -- that is, land use planning, building codes, and emergency response planning -- is somewhat artificial, particularly for land use planning and building codes. While recognizing the obvious interrelationships, we have chosen to present these activities separately for purposes of highlighting each of them.

The decision-making framework guiding the presentation of our research suggests that many roadblocks may be erected to prevent or detour adoption of public policy. Likewise, policy implementation is never a certainty. As we begin our examination of policy outputs and implementation, it is sobering to recall the admonition of Pressman and Wildavsky:

> Our normal expectation should be that new programs will fail to get off the ground and that, at best, they will take considerable time to get started. The cards in this world are stacked against things

happening, as so much effort is required to make them move. The remarkable thing is that new programs work at all.[1]

As this and the next two chapters unfold, there will be many occasions to point out missed opportunities, inadequate attention to problems, and an inability or unwillingness to make hard decisions. Our critical comments must be placed in the context of both the positive accomplishments which will be represented as well as the Pressman and Wildavsky warning that <u>all</u> public policy programs face difficult implementation problems.

This chapter starts with a brief discussion of traditional local government involvement in land use planning and then moves to an equally brief consideration of the potential role of land use planning in mitigating seismic risk. We then examine what the Seismic Safety Elements have said about land use, the way in which the Elements have been implemented in the land use area state involvement in local planning through the Alquist-Priolo Act, and some specific cases of land use planning involving seismic safety questions in certain jurisdictions.

LAND USE PLANNING AND LOCAL GOVERNMENTS

Planning for the use of land within their legal territory has been one of the most significant discretionary acts available to local governments since the U.S. Supreme Court clarified this right in Euclid vs. Ambler Realty Co. over fifty years ago.[2] With only a few exceptions, local governments in the United States have used this constitutional "police power" to regulate and guide the development of land within their communities. Indeed, for many years now, local governments in California have had a mandate from the state to develop comprehensive land use plans. The state has established guidelines and suggested approaches to planning, but the specific, parcel by parcel decisions are the province of local governmental decision-makers.

Decisions about land use can generate controversy and, therefore, land use issues often figure prominently on local political agendas. The physical proximity of the decision-makers to the disputants in a land use controversy combines with the finality of most land use decisions to produce a personal and oftentimes heated political debate. For property owners, financial institutions, developers, realtors, construction unions, and others involved in land development the stakes are high. Large sums of money and many jobs are often involved. Furthermore, land use decisions often provoke extended debates about property rights. This dispute centers on the ability of a property owner to use land as desired versus the efforts of the community -- embodied in the official decision-makers -- to regulate the use of land according to an overall scheme reflecting underlying values that may not be congruent with property owners' intentions.

Records of past seismic events, contemporary geologic investigations, and advances in understanding earthquake phenomena have all lead to a more complete and sophisticated data base. Yet, much remains unknown or partially understood. For instance, it is difficult to locate accurately an active fault within an already developed urban area because of the serious disruption that would be required by the necessary investigations. Local planning decisions must be made frequently with less than complete geological and seismological data.

While most urban areas of California are criss-crossed with fault lines, it is clear that some land may be more susceptible to earthquake-induced problems than other areas. Such problems include ground rupture, ground shaking, landslides, tsunami and seiche, and liquefaction. Land-use planning, including its enforcement through complementary zoning ordinances offers the potential to mitigate structural damage and human loss from earthquakes. At an extreme one could argue that sound land use planning in a seismically active state such as California should lead to a prohibition on building <u>anything</u> on <u>any</u> land suspected of being vulnerable to seismic forces. Such a philosophy of land use would render enormous amounts of land suitable only for "open space" designation; that is economically costly, legally subject to question, and so politically volatile an approach that it remains only a theoretical extreme Furthermore, so much of urban California is already built up in areas of moderate to high risk that to implement fully such a philosophy of land use would necessitate the removal of tens of thousands of existing structures -- a highly unlikely occurrence.

Backing off from an extreme approach of no development whatsoever in risky areas, it is still possible for land use planning to serve an important role. Distinctions among and restrictions on the type of structures permitted in certain areas is one such example. While it may be sensible to permit the construction of single-family, wood-frame houses within close proximity to a potentially active fault, it may not at all be appropriate to authorize the construction of a hospital, fire station or other critical facility in the same location. Another important way to overcome limitations imposed by faults or the geology of a parcel of land is to permit development, but require extensive soils tests so as to increase knowledge about the best placement of a structure on a particular piece of land.

Yet another way to utilize land use planning for seismic risk mitigation is to combine geologic knowledge of a site with structural design practices that minimize the danger of building failure from the specific hazards of the land in question. Land use planner William Spangle recognizes this approach when he says:

> The major factor in reducing seismic risk is good

> structural design. Shaking, of course, is the most pervasive earthquake effect and little can be done about its damaging effects through land use planning. Seismic risk, however, can be reduced by restricting the use of areas subject to various forms of ground failure.[3]

The approach taken by the state Seismic Safety Commission exemplifies the attitudes of most land use planners who are concerned about seismic safety. As a land use planning policy the Commission recommends:

> Major public or private projects should not be located in areas with significant seismic or geological hazards unless no reasonable alternative sites are available and strong measures can be taken in design and construction to insure acceptable safety levels.[4]

In the final analysis, local governments make land use decisions -- sometimes implicitly and without good information -- that "determine" the extent of risk found acceptable. These decisions may restrict the use of land to certain specified uses or configurations, not all of which will be acceptable to the owner or developer. There have been very few outright prohibitions on development for seismic risk reasons, but as this chapter will discuss there have been attempts to use land use planning prerogatives to inform and sometimes to reduce potential earthquake damage. It is also true that some jurisdictions have paid only the barest of lip-service to land use planning techniques as a way to reduce risk.

State Law and Guidelines for Seismic Safety Elements

State law requires every city and county in the state to have a General Plan, and that Plan must contain certain specified elements. As mentioned in Chapters 1 and 3, one of the legislative aftermaths of the 1971 San Fernando earthquake was the passage of a law mandating the addition of a Seismic Safety Element (SSE) to the General Plan of every jurisdiction. The SSE's of the various jurisdictions will be used here as a key indicator of the approach taken by local governments in California to land use planning for seismic risk mitigation. We will examine the contents of the SSE's, present an evaluation of them, and then discuss their implementation for land use purposes.[5]

The state has delegated much of its "police power" guaranteed by the United States Constitution to localities, and the policy area of land use planning is a good example. Article XI, Section 7 of the California Constitution provides that:

> A county or city may make and enforce within its limits all local, police, sanitary, and other ordinance and regulations not in conflict with general laws.

This delegated authority gives local governments the right to promulgate land use plans which the legislature, in turn, has required them to do.

Before turning to an examination of the actual SSE's, we must first indicate the state law and guidelines under which the Elements were written. The state's role is best thought of as providing direction and boundaries for local government land use planning. The SSE's place in local General Plans is shaped by the constitutional and legal structure described in the following statement from the current state guidelines on General Plan Elements:

> State law shapes the local exercise of police power by requiring cities and counties to prepare and adopt a general plan and specifying the content of the general plan, as well as procedures and deadlines for adoption. Conceptually and legally, the general plan, in turn, guides the exercise of police power through zoning and subdivision regulation and the exercise of the corporate power through the provision of capital facilities.[6]

When the state legislature added the Seismic Safety Element to the list of required elements in city and county General Plans, the exact contents of an SSE were not specified. As originally written in 1971, California Government Code, Section 65302(f) required:

> ...a Seismic Safety Element consisting of an identification and appraisal of seismic hazards such as susceptibility to surface ruptures from faulting, to ground shaking, to ground failures, or to the effects of seismically induced waves such as tsunamis and seiches.
>
> The Seismic Safety Element shall also include an appraisal of mudslides, landslides, and slope stability as necessary geologic hazards that must be considered simultaneously with other hazards such as possible surface ruptures from faulting, ground shaking ground failure and seismically induced waves.

The legislature made additions to this law in 1978. The changes accomplished two objectives: (1) increased a local jurisdiction's flexibility in preparing the SSE by allowing a city to adopt the relevant parts of a county SSE as its own Element and (2) required all local jurisdictions to send a copy of their SSE (after its adoption) and associated technical reports to the State Divisions of Mines and Geology. This state agency was not given the authority to review or require any changes in the Elements they receive. None of the cities included in this research had adopted a county SSE, primarily because each had completed its efforts before the law was changed.[7]

Interim guidelines were used for a time after the law was passed, but in 1973 the California Council on Intergovernment Relations (CIR) published and distributed a set of final guidelines for the preparation of Seismic Safety Elements.[8] The cities and counties studied in this research prepared their Elements under these guidelines. The SSE guidelines stated that the primary objective of the Element was "to reduce loss of life, injuries, damage to property and economic and social dislocations resulting from future earthquakes "[9]

After a very brief introduction to the major sources of problems resulting from earthquakes the guidelines mention specific features that should be included in any SSE. Because the suggested nature and scope of an SSE as identified by the guidelines may serve as a convenient benchmark against which an Element may be judged, the original material from the guidelines is reproduced here. The CIR guidelines cover more than land use planning issues, but all aspects allow us to understand the context of the land use planning segments as well as lay the groundwork for subsequent consideration of building codes and emergency response planning. Accordingly, the Guidelines state that an SSE should contain:[10]

I. <u>Scope and Nature of the Seismic Safety Element</u>

A. A general policy statement that:

1. Recognizes seismic hazards and their possible effect on the community.
2. Identifies general goals for reducing seismic risk.
3. Specifies the level or nature of acceptable risk to life and property.
4. Specifies seismic safety objectives for land use.
5. Specifies objectives for reducing seismic hazard as related to existing and new structures.

B. Identification, delineation and evaluation of natural seismic hazards

C Consideration of existing structural hazards.

D. Evaluation of disaster planning program.

E. Determination of specific land use standards related to level of hazard and risk.

II. <u>Implementation Plans</u>

A. Concurrent or subsequent revision of other General Plan elements to give specific recognition to seismic safety policies and criteria.

B. Inclusion of appropriate requirements and procedures in zoning, subdivision and site development regulations and building codes. Designation of special zones with special land development regulations such as "seismic hazards management zones."

C. Preparation of renewal plans for areas where a change in use and development pattern is necessary because of major seismic damage or extreme hazard.

D. Building inspection program to identify unsafe structures and instigate necessary corrective measures.

E. Inclusion of potential earthquake destruction in contingency plans for major disasters and emergencies. Review and liaison with Emergency Preparedness Organizations and Police Departments of overall plans and major public facilities proposals as to their adequacy in emergency situations.

F. Education programs to develop community awareness of seismic hazards.

G. Updating the Building Code to reflect changes in technology.

These Guidelines emphasize the need for an SSE to (1) define the overall character of the seismic safety hazard in a jurisdiction and (2) indicate the steps necessary for implementing action to mitigate the risk from such hazard. In other words, geologic and seismologic data should be collected, assessed, and translated into appropriate public policy to mitigate risk. The General Plan guidelines are advisory and do not carry the force of a state mandate, although they have been influential in determining the outcome of a few lawsuits challenging the validity of certain local General Plans.

Contents of Seismic Safety Elements

A careful reading to the SSE´s in the research jurisdictions permits a review of their content and a characterization of them. We now offer a thumbnail sketch of the land use planning aspects of each SSE, using the Council on Intergovernmental Relations guidelines and some criteria employed by the State Seismic Safety Commission in its own 1977 review of several Elements.[11] We will add commentary based upon our own evaluation and reading of the Elements.[12] In keeping with our research design, the presentation here will be organized so that we can group the jurisdictions into those with earthquake experience and those without, both within a metropolitan area and in "single cities." Due to the disparate style of the various Elements, the format of the subsequent sections may not be entirely consistent. However, each section below presents an accurate summary of the essential land use planning ingredients found in the Elements. After discussing each of the thirteen SSE´s, we will collate the information on several important dimensions into one table. Thus, Table 4-1 allows a quick comparison of the SSE´s characteristics.

Metropolitan Area Jurisdictions With Recent Earthquake Experience

Burbank. The process by which the city of Burbank adopted its Seismic Safety Element makes it notably different than other jurisdictions. In December, 1972 the city council adopted what was characterized as an "interim" SSE written by the city staff. This Element was interim because the state had only provided partial guidelines for SSE's and because "of a scarcity of detailed geologic data on the city of Burbank."[13] The SSE contains thirty-five pages, of which only fourteen pages might be called specific to Burbank while the rest contains general information about earthquakes and their potential for damage.

As an overall objective this Element seeks to "reduce loss of life, injuries, damage to property and economic and social disruption."[14] Of three major recommendations for implementation two bear a relationship to land use: (1) form a citizens task force to determine what risk is acceptable for Burbank and (^) undertake geologic and seismologic studies of the city. The land use sections of the Burbank SSE (as is true with other sections of the SSE) reads like a "Request for Proposal" for a technical report on seismic matters. For example, the SSE suggests that a geological survey is necessary and the proceeds to spell out what such a survey should contain.

In October, 1974, the city council adopted a technical report prepared by an outside consultant as an apparent addition to its SSE. This sixty-eight page report contains nineteen pages of general introduction to earthquakes and Southern California earthquakes six pages showing Burbank in relation to the epicenter of Southern California earthquakes of the last four decades, and eight pages of general definitions and discussion of types of faults. While the report touches on several potential hazards associated with earthquakes, most of the Burbank-specific part discusses the consequences of ground shaking from the Sierra Madre fault system. Based upon a model of expected ground response to an earthquake on this fault, the city is divided into zones of seismic/geologic risk In a summary matrix, the report suggests that for a given project, soils engineering, engineering geologic or fault evaluation investigations be conducted in each zone depending upon whether the structure being proposed is to have limited occupancy, normal occupancy or is a critical facility. The only major fault within the city, the Verdugo fault, is classified as "potentially active" and not given much attention except to suggest careful site investigation for any proposed critical facilities near the fault

Neither the Technical Report nor the interim report contains any suggestions for changes in existing ordinances or practices, nor does it relate its finding to any other part of the General Plan.

Glendale. The sixty-six page Glendale Seismic Safety Element was prepared by a consultant and adopted by the city council in 1975. The Element is divided into a section on Policy and a Technical part, with the former occupying the first fifteen pages. The Element contains copies of the planning commission and city council resolutions adopting it as part of the City General Plan.

The Element specifies four goals which guided its preparation:[15]

1. Prevention of serious injury and loss of life.
2. Prevention of serious structural damage to critical facilities and structures where large numbers of people are apt to congregate at one time.
3. Insuring the continuity of vital services and functions.
4. Education of the community.

The Element identifies ground shaking from the Sierra Madre Raymond Hill and San Andreas faults as the major earthquake hazard facing Glendale. Less important hazards are landslides and liquefaction. The one major fault running the length of the city -- Verdugo fault -- is judged to be "potentially active" and, therefore, according to the consultant, not worthy of major concern. For land use planning purposes, the Element summarizes in one matrix and a related "Seismic Hazards Map" which critical facilities. normal facilities and limited facilities are generally or provisionally suitable, or generally unsuitable, or restricted in designated areas of the city. Four zones are designated on a hazards map as being variably at risk from ground shaking caused by an earthquake on the Sierra Madre fault.

While the Element contains a good discussion of the seismic history of Southern California, it does not discuss the impact of the 1971 San Fernando earthquake on the city of Glendale, nor does it contain a subsurface geologic map. Faults known to be located within the city and other nearby faults which could impact Glendale are mapped and briefly discussed. The Element points out the data not presently available which would allow more definitive and helpful analysis of several faults, including a few within the city boundaries.

While areas where liquefaction, landslides and settlement could occur are mentioned and some are mapped, the Element claims that precise location of these areas is outside the scope of the work performed for the Element and should be the responsibility of those private individuals who seek to develop land within the broadly designated areas.

The Policy part of the SSE contains twenty-one policy recommendations and some general ideas about how to implement the Element. Seven of the recommendations deal with land use matters [16]

1. Require geological and soils reports in any area subject to potential landslide, liquefaction or

strong ground shaking.

2. Revise city building code to reflect the seismic hazards zones developed in the SSE.

3. Prohibits any new construction directly astride or across known active faults.

4. Enforce the state law requiring that development plans for all subdivisions be submitted for review by the local government.

5. Evaluate further the impact of having certain areas designated as susceptible to more than one earthquake hazard.

6. Evaluate three faults for recency of movement and more precise location.

7. Appoint a "Seismic Safety Review Committee" to oversee the implementation of the SSE and keep it current.

The implementation section *vis-a-vis* land use suggests that the city relate the SSE to other parts of the General Plan and revise, review, and update various city ordinances to reflect the information contained in the SSE; the Element itself provides no direct guidance on this point.

This Element places heavy emphasis on its model of ground shaking from a nearby fault. While the model highlights the cause of major damage in past earthquakes (i.e., ground shaking), it is important to remember that the computer generated results are only as good as the data and assumptions employed. As the SSE admits, there are data gaps which prevent precision and, therefore public policy made in reliance upon the SSE must take this into account.

City of Los Angeles. After receiving a very thorough technical report called a "Seismic Safety Analysis" from an outside consultant in 1974,[17] the city adopted its own "Seismic Safety Plan" the following year. The actual SSE is a short fourteen page summarized statement of the material contained in the technical report, supplemented by a few generalized policy statements. With respect to land use planning, the SSE contains a statement defining the role of the SSE:

> Although the Plan does not precisely determine land uses, geologic and seismic considerations should play a major role in determining land use. A primary purpose of the Seismic Safety Plan is to provide information necessary for warranted revisions in the General Plan, in order to respect geological hazard limitations.[18]

Contained among a list of policies the city should follow is one relevant for land use: the city should commit itself to using geological and seismological information in all land use decision and seek additional information where there are gaps. The SSE also contains a map of areas susceptible to fault rupture and those areas where slope stability may be a problem. Both such areas, it is suggested, warrant careful investigation before permitting development.

If the actual Element is viewed as a generalized statement, the technical report is best seen as a comprehensive and detailed presentation of data, policy alternatives, and recommendations. The 325 page report contains 253 pages of commentary and data on Los Angeles' specific seismic condition and approaches that might be taken to it, 17 pages of references which fully document the report and 55 pages discussing the methodology and terminology used in the report's preparation. The technical report presents the geologic conditions underlying the city and discusses the associated hazards.

The distinguishing characteristic of this technical report is the way in which it presents different policy approaches for the city based upon different levels of "acceptable risk." The report shows the consequences of accepting differing levels of risk, and thus allows for some discussion of cause and effect in the decision-making process. The levels of possible risk are developed primarily by combining differing soil conditions with various applications of the requirements of the Uniform Building Code. Once the city has chosen the level of risk it prefers, the technical report contains data analysis and maps which permit a careful examination of "earthquake failure mechanisms" on any given parcel of land. This specificity allows a careful monitoring for seismic safety on all future development proposals.

Numerous recommendations for implementation are found in the technical report Most of the recommendations pertain to building codes and their enforcement, but some recommendations have land use considerations and land characteristics built into them. The actual suggested wording for new or revised city ordinances is also included.

County of Los Angeles. The Seismic Safety Element of Los Angeles County, adopted in 1975, was prepared entirely by county staff. Overall supervision and writing of the Element itself was provided by the Department of Regional Planning, while the Engineering Geology Section of the County Engineer's Office wrote the forty-five page technical report that is included as an appendix of the Element. The technical report locates and discusses all major fault systems in the county and very briefly discusses the potential hazards associated with earthquakes. The report contains two maps showing relative slope stability and "seismic zones." Both maps are reproduced on a scale that is non-site specific and certain parts are difficult to read. The seismic zone map takes into account potential ground rupture from active and potentially active faults, liquefaction and landslide zones, and areas in which high, moderate, or low degrees of ground shaking is to be expected. The map delineates six seismic zones, but does not indicate how movement by the various identified faults might translate into consequences for structures or land. The technical report concludes with some recommendations for requiring geologic and/or soils reports in certain circumstances.

The Policy Report was prepared by the Department of Regional Planning staff. After outlining the potential consequences of an earthquake in Los Angeles County, the Policy Report states that the major goals of the Element are "protection of life and property" and "Reduction of adverse economic, environmental, and social conditions resulting from geologic activity."[19] The Report contains a list of twenty-two policies to carry out the above stated goals, two of which are of particular relevance for land use.[20]

1. Restrict development within active or potentially active fault zones.

2. Adopt and enforce selective land use and building regulations within areas of high seismic hazards.

The Element then discusses "implementation programs" by pointing out that three implementation strategies are possible: abatement, impact reduction, and avoidance. How these three strategies relate to various county functions are presented in a matrix.

The most important part of the Policy Report is the "Action Program" containing specific short, intermediate, and long-range actions the county should undertake. The Report offers forty-six short-range actions and fourteen other actions combined into a medium and long-range category. By far the majority of action recommendations involve structures, both existing and newly proposed. Most recommended actions call for the Board of Supervisors to direct the County Engineer to gather a variety of information and apply it to new and old buildings. Land use planning is confined to a few generalized recommendations, such as the suggested admonition to the Department of Regional Planning that it "include consideration of seismic and geologic hazards within its zoning ordinance."[21] One of the most important land use recommendations is the suggestion that the Supervisors direct the County Engineer to conduct field investigations of scores of areas in the unincorporated part of the county where there is at least a "moderate" chance of a landslide.

San Fernando. Spurred by the 1971 earthquake as well as the new state requirement, the city of San Fernando contracted with a consultant in 1973 to produce a report on seismic hazards facing the city[22] The report was not based upon original field work, but relied upon already published sources of information. It yielded a seismic hazard map showing the areas of the city subject to ground shaking and ground breakage. The report consists of approximately twenty pages of analysis specific to San Fernando and thirty-three pages describing methodology and general earthquake phenomena. Known faults are indicated. Perhaps the strongest recommendation in the report suggests that the city not permit the building of critical facilities in an area of potential ground rupture. As for other structures within the identified hazard zones, the report urges that the city:

> ...should discourage unfavorable site/structure combinations; but should not forbid a type of development if someone is willing to pay for proper design and construction...There is almost no place that cannot be built upon provided the proer design and construction procedures are followed.[23]

The city's actual SSE was adopted as part of its General Plan in 1974. It was based upon the above seismic hazards technical report. The Element contains twelve pages of general information about earthquakes and the 1971 earthquake in particular, a short summary of the technical report and the associated hazard map, and a page of recommendations. The major land use implication of the six recommendations can be seen in this statement:

> It is suggested that the Director of Building and Planning refer persons requesting building permits to the amended Zoning Map. (Showing the Hazard Zones.) In this way potential buyers of buildings will be made aware of possible seismic hazards.[24]

The Element does not contain many action oriented recommendations nor does it suggest an implementation program; the few recommendations found in the Element are quite general

Simi Valley. The city of Simi Valley chose to combine its Public Safety and Seismic Safety Elements into one document. They contracted with a consulting firm to produce the combined element.[25] A preponderance of the ensuing report is devoted to seismic safety: there is a seventy-five page technical report on seismic safety, nine pages of technical information about public safety in general, and a twenty-one page "Policy Report" which combines both safety and seismic safety. The Element was adopted by the city council in 1974.

The technical report concentrates primarily upon the potential ground shaking that could occur from an earthquake on the Santa Susana fault. Nowhere in the report is it mentioned that the Santa Susana fault may be different than the fault used by the consultant in developing the model for predicting ground shaking in Simi Valley.[26] All known faults in the Simi Valley area, except the Oak Ridge fault, are plotted on a map presented in the report. Liquefaction and landslides are discussed and analyzed as potential hazards from an earthquake on a nearby fault. The technical report culminates in a map which shows areas subject to different levels of risk from landslide and four zones of ground shaking severity. Goals which guided the preparation of the policy section of the SSE are identical to those seen in other communities:

1. Prevention of serious injury and loss of life.
2. Prevention of serious structural damage to critical facilities and structures where large numbers of people are apt to congregate at one time.
3. Insuring the continuity of vital services and functions.
4. Education of the community.[27]

The policy section explains what was presented in the technical report and its implications. Most of the twenty-two recommendations deal with buildings; a few pertain to land use. The only land use related recommendation that can be implemented from the SSE and its data is the suggestion that no structures should be permitted within known fault zones within the city. Other land use recommendations require further study, investigation, and decision-making by the city and are not possible to implement upon adoption of the SSE, e.g, "Evaluate land use impacts resulting from ´stacking´ of multiple hazard zones."[28]

"Single City" Jurisdiction With Recent Earthquake Experience

Santa Rosa. The city of Santa Rosa has combined its Seismic Safety and Safety Elements. An outside consultant was hired to prepare the consolidated elements. The 190 page report is divided into a policy section and technical section, with the first forty pages devoted to policy matters.

In summarizing the conclusions of the technical report, the policy section states that the San Andreas and Healdsburg-Rodgers Creek fault systems pose the most serious seismic threat to Santa Rosa.[29] Specifically, ground shaking from movements on either of these two fault systems -- particularly the latter -- is of serious concern. Surface rupture along the Healdsburg-Rodgers Creek fault system is also a definite possibility. Liquefaction, settlement, and landslides are all considered secondary seismic hazards. Several pages are devoted to a discussion of the concept of "acceptable risk," with the strong recommendation that critical facilities be designed so that they "not only remain standing but should be able to operate at peak efficiency in the event of a disaster "[30]

The statement of goals is identical to that just discussed in Simi Valley and in other SSE's. The Santa Rosa SSE contains some specific and strong language in its land use recommendations. It recommends that site specific investigations should be required for all proposed developments within the Healdsburg-Rodgers Creek fault system zone, areas subject to moderate or high risk of landslide, and those areas of potential liquefaction. If potential hazards cannot be mitigated, prohibition of the use is the only alternative."[31] Critical facilities should be "discouraged from locating within the [Healdsburg-Rodgers Creek] fault zone altogether" and they should "not be permitted to locate in areas of liquefaction potential."[32]

In the seismic safety part of the technical section, the Element spends about thirty pages describing earthquakes generally, their associated consequences and important terminology. Locations of known faults are indicated on two maps. The major portion of the technical section is devoted to the "engineering characteristics of expected earthquakes." In practice what this amounts to is a discussion of the effects of ground shaking in different parts of the city based upon a computer generated model; a map of very large scale is presented to show ground shaking potential based upon distance from the Healdsburg-Rodgers Creek fault. Maps are also presented to show the areas of known and potential landslide problems and liquefaction potential; almost one-half of Santa Rosa is indicated to have potential liquefaction problems. A detailed geologic map is not presented and there are some confusing aspects to the way in which nearby faults are identified. Two faults located close to the city and perhaps within the city -- Tolay and Maacama faults -- are shown on at least one of the two maps which identify relevant faults, but they are never discussed within the text of the element. The analysis of ground shaking potential produced a map indicating nine zones of increasing degree of risk, with some areas as small as a few city blocks. This specificity may belie the "considerable generalization [that] is necessary"[33] in work of this kind. No specific recommendations are made to translate this detailed microzonation into land use regulation based upon the nine seismic zones.

Metropolitan Area Jurisdictions Without Recent Earthquake Experience

Alameda County. Adopted in 1976, the Alameda County Seismic Safety Element consists of thirty-four pages of material prepared by the county staff. The Element starts with an introduction to earthquakes and a brief description of seismic hazards in general. It then proceeds to a brief history of seismic events in the county. A list of active and potentially active faults accompanies a map indicating the location of the active faults. The primary and secondary seismic hazards facing Alameda County are then discussed. Primary hazards include tectonic creep, ground rupture, and regional uplift and subsidence while the secondary hazards mentioned are ground shaking, liquefaction, lurch cracking, lateral spreading, differential elements, landslides tsunami, and seiches. The SSE does not provide much specificity about the potential land use planning consequences of these hazards because no maps accompany the text.

Because the county does not have land use planning jurisdiction within the cities of the county, the SSE concentrates almost exclusively on unincorporated land. A section titled "Planning Considerations for Seismic Safety" mentions several types of general policies that could be adopted to deal with surface faulting, ground shaking and ground failure, but it makes no specific recommendations for new law or regulation. Witness the following example of how land use planning consequences are handled:

> Knowledge of ground shaking effects may be cause to implement low intensity land use controls especially when interpreted with other seismic and/or general plan considerations. Geologic hazard zoning offers a possibility for identifying hazard prone areas.[34]

The SSE does point out that the county requires soils and/or geologic reports for proposed developments in many areas. Reference is made to the need for more geologic data collection and revision of relevant policies based upon any new information.

Berkeley. The city's combined Seismic Safety and Safety Element is contained in a sixty-four page document adopted in 1977; approximately one-half of the Element is devoted to earthquake related issues and problems. The three major faults which could cause significant problems for Berkeley -- San Andreas Hayward and Calaveras -- are mapped. The Element points out and briefly explains the seismic hazards that threaten the city such as ground rupture, ground shaking, landslides and liquefaction. An explanation with maps showing the areas of the city susceptible to the several different hazards comprises the main body of the seismic safety element. The geology and seismology of the area are presented in generalized fashion

In a concluding three page section titled "Goal and Policy Recommendations" the city's goals are presented:

> To reduce to a minimum, risks associated with natural hazards, to guide activities during an emergency and to minimize problems related to the rebuilding of the city after a major disaster.[35]

Of the eight policy recommendations contained in the combined Elements, only one directly pertains to land use:

> Enact special development regulations for known seismic-related hazard areas and for critical essential or high occupancy structures throughout the city.[36]

Two specific elaborations on the above policy are offered.

It is recommended that the city require "appropriate structural design reinforcement" in all critical essential, and high occupancy structures proposed for development within the state-defined Special Zone along the Hayward fault. Without elaboration, it is also suggested that "Berkeley could acquire lands subject to severe seismic and geologic hazards for open space or low intensity park and recreational activities."[37]

<u>Fremont</u>. In 1975 the city of Fremont adopted its joint Seismic Safety and Safety Elements. The forty-one page Element was written by city staff and was based upon a technical report prepared by a consultant. About one-half of the Element is devoted to a succinct and accurate presentation of the consequences of an earthquake for the city. Possible hazards are discussed, described, and mapped. Ground rupture and landslides are said to be the most serious hazards facing the community in the event of an earthquake. The "Generalized Geologic Hazards" map attempts to summarize and combine the known hazards A note on the map emphasizes that it is "not to be used as a substitute for site specific studies."[38] After locating the potential hazards the text of the Element then contains a narrative which discusses existing and planned-for land uses in relation to the potential hazards; this serves to highlight some problem areas and possible directions for land use planning and regulation. The single "action" recommendation relevant to land

use planing calls for an amendment to the Municipal Code to require geologic studies for land development in "Geologic Hazards Zones."

The Element concludes with a set of recommended geologic studies that should be performed on a variety of kinds of sites for different types of proposed structures. Several mitigation measures are suggested for ground shaking, liquefaction, surface rupture, and slope instability. The land use measures are mentioned, but their full implication is not discussed. Under the liquefaction hazards the Element recommends,

> Avoid construction at sites where specific studies show that liquefaction will occur and that the consequences of liquefaction will be particularly severe.[39]

Does this mean that such sites should be designated as "open space" on the General Plan? How feasible is such a designation? Such are the obvious questions that follow the recommendation, but which are not specifically addressed. However, the information necessary for decisions on the land use implications is available in the Element.

Hayward. The city of Hayward is unique among those included in this research because it started an "earthquake study" prior to the 1971 San Fernando earthquake and the resulting state mandated Seismic Safety Element. The study became the SSE;[40] it was prepared by the city staff with the advice of the planning commission and a few outside consultants. About one-half of the thirty-nine page Element is devoted to a generalized presentation of earthquake phenomena, the seismic history of the Hayward region, and the types of damage that occur when an earthquake strikes an urban area. The major hazards facing Hayward are a result of the Hayward fault which runs the length of the city. In addition, the San Andreas and Calaveras faults are close by. Ground rupture and landsliding are seen as serious hazards.

Within the Hayward fault zone, the SSE recommends that all who propose developments be required to submit extensive soils and geologic reports along with their building plans. The Element recommends that all structures for human occupancy be prohibited over fault traces. For land outside the fault zone the SSE recommends that all high rise or high occupancy developments submit soils and geologic site specific reports. The Building Official is encouraged to require appropriate reports on any land within the city if he so deems it necessary. There is no effort in the SSE to divide the city into areas of varying degrees of risk nor is there an indication of whether certain areas of the city are more susceptible to certain hazards than other areas.

Oakland. In 1974 the city of Oakland adopted a combined Seismic Safety and Safety Element which had been prepared by city staff.[41] The fifty-one page Element relies extensively upon previously published material from the U.S. Geological Survey and the California Division of Mines and

Geology. A very brief and generalized discussion of the city's geology concludes with a map dividing the city into six geologic zones. The only faults mentioned or mapped are the well-known Calaveras Hayward and San Andreas faults; the Hayward fault runs the length of the city. In recognition of the damage that can occur from ground shaking and landsliding, the Element divides the city into six zones of potential ground response and three zones of landslide potential. No mention is made of any differences in impacts from earthquakes of various magnitudes on the several faults. These maps are based upon geologic information, but the maps are not site specific.

Two over-all goals to guide the city have been adopted as part of the Element:

> To minimize the loss of life, injuries, and damage to property of Oakland citizens resulting from natural disasters.
>
> To recognize natural environmental hazards in planning for the city's future development.[42]

Several land use policies are suggested to implement these general goals. The more prominent ones include:

> The City in conjunction with other governmental agencies. when feasible should utilize lands subject to severe seismic and geologic hazards for low intensity park and recreational activities or open spaces.
>
> The City and other public agencies should not locate public facilities for human occupancy in fault zone areas unless all other available sites are infeasible.
>
> The City should consider prohibiting critical facil-

ities such as hospitals, schools, utility's installations and communication centers from locating on lands subject to severe seismic or geologic hazards.[43]

Ideas for implementing these policies are discussed briefly without indicating specific regulations or ordinances that would be necessary to carry out the policies.

"Single City" Jurisdiction Without Recent Earthquake Experience

Salinas. In 1977 the city of Salinas adopted its Seismic Safety Element. It was prepared by the city staff with the advice of a few outside consultants and with reliance upon a county-wide Seismic Safety Element previously published. The document contains forty-two pages along with supporting technical appendices. A brief discussion about worldwide earthquake patterns is followed by a presentation of regional and localized geology.

The most important feature of the local geology is a 1,050 foot layer of alluvium. The Element identifies ground shaking from an earthquake on the San Andreas fault as the most significant seismic hazard facing the city. Based upon an analysis of predicted ground response, the city is categorized into four seismic hazard zones and each zone is rated "minor," "moderate", or major" according to the degree of potential hazard due to ground shaking, differential settlement, liquefaction, lurch cracking, lateral spreading, and unstable slopes.[44] Only minimum attention is given to land use. It is suggested that the city require developers to provide geologic site reports along with their soils analysis.

Summary of Seismic Safety Element Characteristics

Table 4-1 summarizes the characteristics of the thirteen SSE's just discussed. This table represents our judgment based upon a careful reading of the SSE's and discussions with planning department staff. Because there are both uniformities and variations in Table 4-1, some discussion of the table is in order.

Not a single jurisdiction or its hired consultants collected any original data in preparation of the Element. Instead, the authors of the Elements relied upon already published material from state and federal agencies, academic researchers, and private consulting firms. The SSE's became an opportunity for collation of information and not a source of new data. Somewhat ironically, almost every SSE points out deficiencies in data and calls for further geologic and seismologic investigations. Such research is expensive and apparently no city or county was willing to spend the money as part of its SSE preparation.

It is also very clear from Table 4-1 that all the SSE authors saw an advantage to keeping technical material

TABLE 4-1:

Seismic Safety Element Characteristics

	Burbank	Glendale	Los Angeles City	Los Angeles County	San Fernando	Simi Valley	Santa Rosa	Alameda County	Berkeley	Fremont	Hayward	Oakland	Salinas
Year Adopted	1972	1975	1975	1975	1974	1974	1977	1976	1977	1975	1972	1974	1977
Combined With Public Safety Element	No	No	No	No	No	Yes	Yes	No	Yes	Yes	No	Yes	No
New Data Collected	No	No	No	No	No	No	No	No	No	No	No	No	No
Consultant Prepared[1]	No[3]	P=yes T=no	P=no T=yes	P=no T=no	P=no T=yes	P=yes T=yes	P=yes T=yes	P=no T=no[5]	P=no T=no	P=no T=yes	P=no t=no[6]	P=no T=no	P=no T=no[7]
Pages	35	66	339	159	12	96[4]	190	34	32	41	39	51	42
Specific Recommendation for Land Use Policy[2]	No	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	No
Specific Recommendations for Implementation of Land Use Policy[2]	No	No	Yes	Yes	No	No	Yes	No	No	Yes	Yes	No	No
Technical Material Separate from Policy Material	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

1 Elements will be categorized as "Consultant Prepared" with respect to the policy material (referred to as "P" in the table) or the technical material (referred to as "T").

2 What this simply yes-no categorization cannot possibly show is the extent and depth of the recommendations. We are merely indicating whether, in our judgement, a jurisdiction's SSE contains specific recommendations.

3 The Technical Report, adopted two years after the SSE, was prepared by a consultant.

4 This does not include the section on "public safety" in the combined Seismic Safety and Safety Element.

5 The County had (previous to preparation of its SSE) contracted for "Geologic Hazard Zone Maps." They are not in the SSE.

6 A few outside experts were asked their advice on specific points, but the work was performed by city staff.

7 The city used previously published technical material and asked a few outside experts for advice on specific points.

separate from policy related discussion. Such separation allows for a careful review of the quality and accuracy of the technical material for those so inclined and it also permits decision-makers and the lay public to focus on the policy implications of the technical material. Most Elements contains a glossary of terms so that those unfamiliar with this technical field, but interested or involved in the policy issues, could understand the rudiments.

The practice of contracting with outside consultants for assistance in preparation of the SSE varied among the jurisdictions. While only three jurisdictions had their consultants prepare the policy section of the Element, twice that number used consultants to prepare the technical reports. That seven jurisdictions chose to prepare their technical reports in-house suggests a few observations -- (1) some jurisdictions (e.g., Los Angeles County) clearly have the staff expertise to produce a competent technical report; and (2) in some areas the already published geological and seismological material is so accessible and well understood that the technical report writing task is greatly simplified. It is not possible to say that the in-house technical reports were generally inadequate or inaccurate, but they were sometimes not as thorough or specific as the best of those prepared by outside consultants.

Table 4-1 confirms a somewhat greater tendency for those jurisdictions without previous earthquake experience to use their own staffs for the technical report preparation, while those jurisdictions with previous earthquake experience exhibited a somewhat greater tendency to use consultants on the policy sections. Several of the technical reports prepared by outside consultants -- with Los Angeles City a good example -- also contain extensive discussion and recommendations that should be properly categorized as "policy" matters. Size of the jurisdiction does not seem to be a factor in determining whether outside consultants will be employed. Los Angeles City chose to use a consultant, while Los Angeles County did it all with county staff.

As mentioned in an earlier section of this chapter, the Council on Intergovernmental Relations (CIR) prepared a set of guidelines to help local jurisdictions organize their SSE´s. While local jurisdictions were "supposed" to follow CIR guidelines and while a reading of the Seismic Safety Elements used here reveals at least minimal awareness of the guidelines by the various authors there is no provision in law for the state to review the SSE´s or to "force" compliance. Furthermore, many parts of the guidelines are vague leaving local jurisdictions with some necessary discretion. This situation, not surprisingly, leads to less than full consonance between the Elements as adopted and the letter and spirit of the CIR guidelines.

Referring to the CIR guidelines applicable to land use planning, we find that virtually all of the Elements contain a general policy statement that recognizes the possible effect of seismic hazards on the community, identifies general goals for reducing seismic risk and specifies seismic safety objectives for land use. Even those Elements which lack much specificity over-all such as Burbank and Alameda County, included policy statements which set out general objectives and express a recognition that an earthquake might do serious damage to their community.

A similar pattern holds for the guideline which calls for the "identification, delineation and evaluation of natural seismic hazards." All SSE's make an effort to satisfy the intent of this guidelines and each succeeds in varying degrees. Variation is found in the sophistication and degree of in-depth discussion given to the "evaluation" of hazards. This variation arises primarily from the gaps in knowledge about subsurface geology. While we find no systematic pattern among Elements when we consider their identification, delineation or evaluation of seismic hazards those Elements which rely upon a general model of ground shaking to produce a microzoned map of the jurisdiction may be deriving land use implications more subtle than warranted by the necessarily rough model.

An indicated in Table 4-1, not every jurisdiction has complied with the CIR guideline calling for "determination of specific land use standards." The Burbank, Alameda County and Salinas Elements contain such generalized statements about land use that we have judged them not to be in conformity with the apparent intent of the guidelines.

The CIR guidelines also suggest specific recommendations for implementation of the land use policy. In our judgment, only five of the jurisdictions in our study comply with the apparent intent of this guideline. (See Table 4-1.) The eight jurisdictions which did not include specific implementation recommendations are equally divided between those which have had recent earthquake experience and those which have not. As most of the policy sections of the eight SSE's without specific implementation recommendations were prepared by in-house staff we can offer plausible explanations although we lack direct evidence. In some cases it is possible that either top level management or certain elected officials provided explicit or implicit cues to those responsible for SSE preparation which indicated that specificity was to be avoided. It is also possible that a combination of time constraints and assignment of a relatively low priority to the SSE resulted in only the most generalized, quickly written commentary.

Even a quick perusal of the length of the Elements as shown in Table 4-1 leads to a few obvious conclusions. The Elements for Los Angeles City, Los Angeles County. and Santa Rosa stand out as the longest by far, while that of the city of San Fernando seems dwarfed by virtually all the Elements. The average length of the Elements is eighty-seven pages.

Those jurisdictions with previous earthquake experience produced Elements averaging 128 pages while those without previous earthquake experience wrote Elements averaging thirty-nine pages. This disparity is clearly influenced by Los Angeles City, Los Angeles County, and Santa Rosa. The large jurisdictions of Los Angeles City, Los Angeles County, Alameda County and Oakland average 145 pages compared to an average of sixty-one pages for the remaining smaller cities.

Too much importance should not be attached to the above numbers. The length of an Element may not always be a good indicator of its value, accuracy, or usefulness. And yet, it is hard to escape the conclusion that some of the jurisdictions have adopted SSE's that simply are not long enough -- e.g., San Fernando -- to contain data and discussion which would comply with the full intent of the law and also permit local decision-makers and interested publics to confront seismic safety issues with adequate information and preparation. Likewise, the relatively small size of the SSE's in the Bay Area jurisdiction may serve as an indication of either succinct writing on a well-known issue or in some cases less than full treatment of important phenomena and issues.

The actual recommendations for land use policy contained in the Elements provide a concise picture of what official policy has been adopted by the various jurisdiction *vis a vis* seismic safety and land use planning. Although the term "recommendations" appears in all Elements, the acceptance and approval of the Element by the legislative body (i.e., city council or board of supervisors) transforms the recommendations of the Elements' authors and the planning commissions into official policy. Therefore, we will consider the adopted Seismic Safety Element land use recommendations as official policy of the city or county.[45]

Table 4-2 presents a categorization of the SSE recommendations for each jurisdiction. An examination of the various land use related recommendations -- reproduced in their entirety in Appendix 4A -- reveals that virtually all of them fall into either of two basic categories. The first category can best be described as a set of recommendations to study, evaluate or gather more data about seismic hazards and risks. The second category contains those recommendations which call for some type of regulatory activity by the local government: require developers to submit various types of soils/geologic reports, prohibit certain types of structures on certain types of land, require zoning laws, etc. As seen in Table 4-2, most jurisdictions have adopted both study and regulatory recommendations, but it would be erroneous to conclude that the jurisdictions' policies are essentially similar.

The recommendations for further study and gathering of data are usually couched in similar language but the regulatory actions adopted are quite diverse. By far the most

TABLE 4-2

A Categorization of the Land Use Recommendations in the Seismic Safety Elements

	Study/Evaluate Data	Regulatory Action
Burbank	Yes	No
Glendale	Yes	Yes
Los Angeles City	Yes	Yes
Los Angeles County	Yes	Yes
San Fernando	Yes	No
Simi Valley	Yes	Yes
Santa Rosa	Yes	Yes
Alameda County	Yes	Yes
Berkeley	No	Yes
Fremont	Yes	Yes
Hayward	No	Yes
Oakland	Yes	Yes
Salinas	Yes	No

common regulatory action adopted in those Elements having such recommendations is the requirement of soils/geologic reports prior to issuance of a building permit. Several jurisdictions took the occasion in preparing their SSE's to adopt as policy the very requirement embodied in the Alquist-Priolo Act for Special Study Zones: setbacks from active faults, no critical facilities within special study zones and soils reports. Berkeley's SSE went further and said that the city should adopt regulations for lands outside of the special study zone that had the same requirements as for those lands within the zone. A few jurisdictions adopted recommendations that represented strong governmental intervention for seismic safety reasons. For example, Fremont's Element considers the possibility of not permitting building within certain areas subject to severe geologic hazards and instead designating such land as open space. Berkeley adopted language which spoke of acquiring all "lands subject to severe seismic and geologic hazards." Finally, Los Angeles County adopted a recommendation to "amend current zoning and subdivision ordinances to restrict, where appropriate, land use types and intensities within potential dam failure inundation areas." These last three examples are clearly the exception rather than the rule; most recommendations for regulatory action are much milder.

In sum, what Table 4-2 and Appendix 4A show us is a pattern of almost uniform policy to gather more data in order to evaluate further seismic hazards; some small regulatory steps have also been adopted. Three cautions are in order at this point: (1) many of the recommendations are not very specific as indicated in Table 4-1; (2) even when the recommendations are specific they usually deal with only the very modest action of requiring reports; and (3) the real test of these recommendations adopted as policy comes only when they must be implemented, a subject of the last section of this chapter.

The State and Local Land Use Planning: The Alquist-Priolo Act

For the most part, the state of California has delegated the land use planning and zoning function to local governments. An obvious exception to this widespread delegation is the Alquist-Priolo Act of 1972.[46] One of the several laws emerging after the 1971 San Fernando earthquake, the Alquist-Priolo Act represents an attempt at a *state* zoning law addressed to a *specific problem*. Because it is a rarity for the state to involve itself directly in local land use planning and zoning, the Act takes on special importance. This section will briefly discuss the Act and its implementation in our research jurisdictions.

Passed in 1972 and amended in 1974, 1975, 1976 and 1979, the Alquist-Priolo Special Studies Zone Act declares the state's intention to assist cities and counties "in the exercise of their responsibility to prohibit the location of developments and structures for human occupancy across the trace of active faults."[47] The Act addresses problems caused by surface fault rupture during an earthquake and not fault creep, liquefaction or ground shaking. The law charges the State Geologist with the responsibility of preparing maps which delineate "appropriately wide Special Studies Zones" which "shall ordinarily be one-quarter mile or less in width."[48] These Special Studies Zones (SSZ) "shall encompass all potentially and recently active traces" of four major fault systems -- San Andreas Calaveras, Hayward and San Jacinto.[49] The State Geologist is also directed to designate Special Studies Zones along other faults that he determines to be active and of potential threat to life and property. All SSZ's are to be indicated on maps which are made available to local governments for comments and review. The State Mining and Geology Board is directed to develop "policies and criteria" to govern the approval of a project by a city or county if the project falls within a designated SSZ. Property owners (or their agents) who are selling property within a SSZ must disclose the existence of an SSZ to a prospective buyer.

A key section of the Alquist-Priolo Act defines what projects within a SSZ fall within the purview of the law. After the initial wording of the definition of a "project" caused some confusion among local officials, the legislature revised the wording in 1979. The operative language now requires a geologic report prepared on a project that is a "subdivision." Specifically,

> Any subdivision of land which is subject to the Subdivision Map Act, Division 2 (commencing with Section 66410) of Title 7 of the Government Code, and which contemplates the eventual construction of structures for human occupancy.[50]

Projects which are exempt from the requirement to prepare a geologic report when they are within a SSZ are "A single-family wood frame dwelling not exceeding two stories when such a dwelling is not part of a development of four or more dwellings" and mobile homes "whose body width exceeds eight feet" and is not part of a subdivision.[51]

Under its mandate to develop policies and criteria for implementation of the Alquist-Priolo Act, the State Mining and Geology Board has developed specific guidelines that must be followed by cities and counties. The most important guideline reads as follows:

> No structure for human occupancy, public or private, shall be permitted to be placed across the trace of an active fault. Furthermore, the area within fifty (50) feet of an active fault shall be assumed to be underlain by active branches of that fault unless and until proven otherwise by an appropriate geologic investigation and submission of a report by a geologist registered in the State of California.[52]

In sum the legislature decided to develop a state mandate in this aspect of local planning and zoning. Within the definitions of the law and the guidelines of the Mining and Geology Board, a project cannot be approved unless a geologic report is prepared and submitted to the State Geologist. The specific setback distance from faults and their traces has been specified as fifty feet for all structures within the SSZ.

Eleven of our research jurisdictions have at least one state designated SSZ within their boundaries Only Salinas and Simi Valley do not. (At the other extreme, Alameda and Los Angeles Counties have several SSZ's each.) That such a large percentage of our research jurisdictions had an SSZ allowed us to focus on the implementation of the Alquist-Priolo Act in a variety of locales. The uniformity of response to the Act and the actual implementation is striking. Or to put the matter in a slightly different way, it was impossible to find any systematic variation in the distribution of attitudes or implementation efforts. There were differences of opinion and approach but we could not isolate any specific reasons to account for the differences and the uniformities seemed much more prominent.

All jurisdictions with SSZ's have taken seriously the law's effort to prohibit placement of any structure astride a known, active fault. No opposition to this policy was voiced and it seems clear that no one objects to this prohibition. Many major projects have been designed (or redesigned) so that they avoid placing structures upon the fault traces. However there has been considerable controversy in several communities -- Hayward, and Santa Rosa, for example -- over the exact location of the fault system, and, thus, the placement of new structures. Everyone agrees that the Hayward fault and the Healdsburg-Rodgers Creek fault do exist and do indeed traverse the cities of Hayward and Santa Rosa respectively, but several efforts to find traces of the faults in the course of seeking approval for projects have proved fruitless in specific areas of each city. Trenching or drilling to find the exact location of a fault can be expensive and there have been many complaints voiced by both developers and city officials when in several successive attempts the faults have proven impossible to locate.

From our interviews with private individuals and public officials, and from a reading of the minutes from many city council and board of supervisors meetings in the eleven jurisdictions with SSE's it is clear that the Alquist-Priolo Act is uniformly having one intended result -- land use planning in the near vicinity of the designated faults has been made more sensitive to seismic safety concerns Seismic safety issues have frequently become points of major controversy in considering the approval of a project, particularly so during consideration of critical facilities such as hospitals and large residential subdivisions. To the extent that local officials private developers, and active citizens have been engaged in public discussion and debate about the merits of a proposed project vis a vis its relationship to an earthquake, one of the major objectives of the Act is being accomplished.

Attitudes toward the State Geologist's office and the State Mining and Geology Board varied. On the one hand, many local officials indicated their pleasure and agreement with the approach taken by the law itself and the state government's implementation. For example, one city planning director indicated that the designation by the state of a SSZ in his city made his relationships with developers much easier. He was able to tell developers that all the mandated requirements and reports were the result of state action and not something he controlled. If seismic safety is defined as a matter of statewide concern and actions taken are required by state law local officials can implement the policy without necessarily being subject to pressure from local interests.

On the other hand, local officials and private developers expressed some criticisms of the way in which the state approaches this issue. The State Geologist's office, it was frequently charged, was too "casual" in delineating boundaries of the SSZ's. This criticism recognizes the admittedly limited knowledge that is available when it comes to locating precisely some parts of the fault systems. Yet it was frequently suggested that if the state was going to adopt a policy such as that embodied in the Alquist-Priolo Act, it had a responsibility to help finance the cost of locating the fault lines. Several local officials also voiced concern that the State Geologist's office was unwilling to consider revisions in the boundaries of an SSZ when repeated trenching efforts failed to find the fault.[53]

These and other criticisms notwithstanding, it is our general conclusion that the land use planning aspects of the Alquist-Priolo Act are being implemented in a way that meets the basic objectives of the law. Very few, if any, structures are being constructed astride a known fault, seismic safety issues within the SSZ's are being aired publicly and are being made a part of the decision-making process, and there is a gradual accumulation of knowledge about the location of major faults. This narrowly drawn effort at a state intervention in local land use planning appears to be successful.

However, the disclosure feature of the law which requires a property owner to reveal to a prospective buyer that the property resides within a Special Study Zone may not be having any effect. After a careful study of the disclosure requirement and its consequences on individual buyers and sellers, Risa Palm concludes:

> It is clear that the present disclosure law has had little impact on individual homebuyers. Policy makers at the state and federal level should be ware of

> the weaknesses inherent in simply assigning the task of disclosure of environmental hazards to the real estate industry and then assuming that homebuyers will, as a result, make more informed decisions.[54]

Our research was not concerned with the disclosure aspect of the Alquist-Priolo Act. so we are not in a position to comment on the relationship of the Palm study to ours. However, our generally positive evaluation of the Act's implementation must be tempered by Palm's conclusions.

Seismic Safety and Land Use Planning Cases: Illustrating Some Roles of Seismic Safety in the Local Political Process

Seismic safety plays several roles in the local planning process and they can be illustrated by reference to some specific cases. These roles are not analytically mutually exclusive; yet their distinctions serve to further our understanding of the way in which seismic safety policy is made within the local decision-making process. We have identified four roles to be discussed in this section: (1) those cases where there is conflict between seismic safety and other important values that a community might hold; (2) those cases involving new, proposed developments in which seismic safety becomes one of the issues raised by those opposed to the proposal; (3) those cases where seismic safety is the major and sometimes the paramount factor in the decision; and (4) those cases where an earthquake has served as an "agent" of land use change.

Conflict and Trade-Offs

There are occasions when concern for seismic safety produces head-on conflict with other values. This kind of case usually involves a land use question that is marked by high visibility and emotion, and thus several major protagonists may be drawn into the fray. A typical case in this category occurred in Hayward in 1976. It is commonly referred to as the "Doric Hotel Case."

Located on one of the busiest downtown intersections, the Doric Hotel had declined in appearance and economic viability when it finally changed ownership in 1975. The new owner submitted plans for modest remodeling and then conversion into the St. Regis Retirement Center. The city's approval was necessary before the conversion could be undertaken. Shortly before the Doric Hotel conversion request had been submitted, an adjacent parcel of land had been the subject of a geologic investigation during the course of efforts to build a restaurant. This geologic report revealed strong evidence of the Hayward fault and suggested that the fault traversed adjoining properties (i.e., the Doric Hotel) as well. Thus the issue was posed as follows: Should the new owner of the Doric Hotel be required to submit extensive geologic reports on his property before the city considered his request for conversion to a retirement center? And if the geologic reports confirmed what had been found previously with respect to the adjacent property, should he be permitted to use the old hotel for such a high density use as a retirement center? On the one hand was the long established risk posed by the possibility of an earthquake on the Hayward fault. Having a high concentration of elderly persons in a structure which had questionable structural integrity and was astride a fault was not in keeping with the best seismic safety practices. Indeed, if the retirement center was a newly proposed building it would have been subject to the Alquist-Priolo Act and a geologic report and appropriate set-back would have been mandatory. On the other hand, there was a definite shortage of affordable, convenient housing in the community for retired persons. The St. Regis Retirement Center would meet a pressing social need. It was also pointed out that remodeling the old hotel and allowing the retired persons to fill it would provide a much needed boost to the central business district of the city.

In this case, the city council had to decide how to trade-off two values against each other -- seismic safety and affordable housing for the elderly. After spirited debate, with participation by the public, the council chose to permit the retirement center conversion and, thereby, downplay the seismic safety concerns.

Seismic Safety and "Stop the Development"

Seismic safety is occasionally injected into the local decision-making process at the point of official government consideration of a development project. In the typical case, a proposed development -- for instance, a residential subdivision -- must receive approval of a planning commission at a public hearing. The hearing serves as a focal point for those who support or oppose the proposal. Not infrequently, private citizens or organized "homeowners" or "improvement" associations testify in opposition to all or part of the proposal. Their motivations are multiple.

A common litany of objections includes references to increased traffic and road congestion, too high a density, adverse impact on air quality, drain on public services, and increasingly a concern about seismic safety. These are cases in which seismic safety is not singled out as the primary objection or focus of controversy, but rather it is listed along with several other reasons why the proposal should be modified or defeated.

There are some very clear reasons for the upsurge in the frequency with which seismic safety questions are injected into these types of disputes. The greater availability of information about seismic conditions that might affect a proposed development makes an understanding of the issue easier. The list of publicly available documents includes the Seismic Safety Element, special geologic reports (particularly within a Special Studies Zone), and the ubiquitous Environmental Impact Report. Because these documents are usually written for the benefit of lay decision-makers, they are also understandable by the lay public as well. The availability of this seismic safety information combines with increased levels of participation by citizen groups in the local planning process and provides an explanation for why seismic safety becomes one of the points on which a land use decision is rendered.

The phenomenon being discussed here is widespread. However, we find no consistent pattern among the jurisdictions that have had earthquake experience and those which have not. For example, Glendale, Burbank, Los Angeles City, and Los Angeles County have all seen seismic safety become a part of many development project controversies, particularly in the foothill regions of these jurisdictions. But at the same time several jurisdictions such as Oakland, Fremont and Hayward have also seen seismic safety questions raised during subdivision project hearings and they have not had a damaging earthquake recently.

As might be expected, opinion is divided as to the motivations of those who raise seismic safety questions in the context of land use decision-making. Many public officials, developers, and contractors felt that those citizen groups who were opposed to a project would add seismic safety as an issue just to help bolster their argument and not from any genuine concern about what an earthquake might do to the proposed development. On the other hand, citizen activists and some planning department officials felt strongly that in certain instances seismic safety had become as important as other more traditional issues. They suggested that there was a very real concern over the actual consequences from an earthquake and they questioned the appropriateness of approving projects which had some seismic risk. Regardless of motivation, it is important to keep in mind that in this category we are talking about cases in which seismic safety was not of paramount concern. All our respondents agreed that in cases such as have been described in this section, the final decisions did not hinge on any one issue, but rather an amalgamation of concerns. Seismic safety takes its place among those concerns.

Only Seismic Safety as the Principal Issue

There are some occasions when seismic safety questions become dominant in a land use decision and because of these concerns the project is temporarily defeated or significantly modified. We know of no cases in which a development proposal was addressed by a city council or board of supervisors and irrevocably turned down because of seismic safety concerns. However, there are two types of cases which fall into this category in which seismic safety plays a dominant role in the land use decision-making process.

It is not unusual for a council board, or planning commission to focus on a question of seismic safety, particularly within a Special Study Zone, and because of it refuse to accept the proposal as submitted. For instance, in the process of seeking approval for subdivisions the developer must show a map indicating the layout of building sites, roads, and utilities. In several instances, the decision-makers have refused to accept the proposed layout and approval has been denied or delayed. Concern over land stability during an earthquake or alignment of roads and utilities as they might be affected by an earthquake have been reasons to make a temporary negative decision. These types of decisions are temporary because in every instance we know of where a developer has been faced with the choice of a permanent rejection of his project or redesigning it to meet the objections expressed by decision-makers the developer has opted to redesign.

A more subtle and less visible planning process also occurs in which seismic matters play a dominant role. This process conforms to the "rule of anticipated reactions" which plays such a prominent role in many political processes. In our present context the following scenario occurs: a developer anticipates the kinds of roadblocks that will most likely be erected in his path toward project approval and seeks a course which reduces or eliminates as many roadblocks as possible. As seismic safety has become one of the "routine" roadblocks, developers seem more inclined to take it into account during their preliminary planning and discussions with planning department staff. Thus, the actual number of instances in which a seismic safety question becomes paramount at the point of official consideration by decision-makers is not as great as would be expected absent seismic safety laws, regulations, and informal attitudes of staff and elected officials. Despite its rather amorphous quality, this scenario does occur and it represents a category of land use cases in which seismic safety plays a major role, albeit before the decision-making process reaches a point of final choice.

To the extent that local planners and elected officials take seismic risk seriously, they will "communicate" an attitude to developers through their prior decisions and informal communication networks. Accurate measurement of this phenomenon is extremely difficult and we must rely primarily upon interview responses from private sector respondents and public officials coupled with some reading between the lines. Although we recognize how soft and impressionistic these data are, it is still possible to identify some communities in which the above scenario tends to occur. The jurisdictions of Santa Rosa Hayward, Fremont, Los Angeles City, and Simi Valley appear to be locations where the rule of anticipated reactions may play a more common role in singling out seismic safety than in the other jurisdictions.

All of the jurisdictions just mentioned have open land that is subject to considerable urban development. Based upon our analysis, there is no way to suggest that jurisdictions without recent earthquake experience are more or less likely to exhibit these tendencies. Nor is size of city a determinant. The only constant we can observe across all five of these jurisdictions is the presence of planning staff officials who feel strongly about seismic safety matters (and seem to communicate this concern to private parties) and an elected body that at least gives tacit approval to this approach.

Earthquakes as Agents of Land Use Change

The devastation wrought by an earthquake may provide the opportunity, resources and motivation for land use change that was lacking prior to the seismic event. Changes become possible in designations of land use and density. Working against any significant change naturally, are the pressures to return to "normal", to return to the land use patterns existing prior to the earthquake. For our research, the city of Santa Rosa was the most obvious example of a community that used an earthquake to help bring about significant land use changes.[55] When the earthquake struck in October, 1969, the city was in the midst of a downtown redevelopment project that relied primarily on federal funds. One year earlier, the city had explicitly rejected the possibility of using urban renewal as a device to further redevelop the downtown because of the low probability of receiving any more federal assistance. However, a specific redevelopment plan had been prepared. The earthquake damaged many buildings in the downtown, both within and adjacent to the redevelopment project. Shortly afterward, the city petitioned the Department of Housing and Urban Development for an "addition" to the original project so that a Phase II could be undertaken. Phase II was the redevelopment plan for the area adjacent to the original project that the city had temporarily shelved in 1968. To the surprise of many, and over the disapproval of the HUD regional office, the city received permission to add Phase II and thereby double the size of the original project.

The city's successful efforts to secure federal cooperation after the earthquake permitted a dramatic change in the land use of the western one-half of the old downtown area. The Phase II area had been the site of older, small retail businesses and small manufacturing firms as well as some older housing units. The redevelopment project became the site for construction of a large regional shopping center in the area. Absent the earthquake, it is difficult to see how the city would have been able to accomplish this land use change in this area. In fact, in 1968 the city had essentially given up. Without question, the earthquake itself was the agent of change because it provided the opportunity, resources, and motivation necessary for the land use change.

Despite our ability to point to Santa Rosa's use of an earthquake to change land use, it would be inappropriate to suggest that an earthquake usually brings about such a result. In fact, the opposite may be more common; the pressure to rebuild along pre-earthquake lines and to continue future land use plans unchanged can be overwhelming. As Spangle and Associates comment, "A key finding is that realistic options for land use change after an earthquake are more limited than the study team expected at the outset of the study."[56] In our own research, we did not find in any of our jurisdictions which had experienced an earthquake -- except Santa Rosa -- significant alterations in either land use patterns already in existence or in long-range planning. To be sure, there were modifications, but in our judgment these were relatively minor.

Implementation

This chapter on land use planning has presented some of the outcomes of the local land use planning process as it relates to seismic safety. We have examined the Seismic Safety Elements produced by each of the jurisdictions, looked at the way in which the Alquist-Priolo Act has had an impact on those jurisdictions which have a designated Special Studies Zone, and presented some specific types of instances where seismic safety plays a role in local land use planning Our conception of the decision-making process (as presented in Chapter 1) suggests that the sequence of activities moves from the phase of official governmental consideration and deliberation on issues to the emergence of "decisional outputs" and then to a phase of implementation. Having presented some of the outputs we can now briefly consider and summarize their implementation.

It is one thing for a jurisdiction to adopt a set recommendation as official policy -- as in the Seismic Safety Elements -- but it may be quite a different matter when it comes to implementation of that policy. The Van Meter and Van Horn model of implementation (see Chapter 1) suggests several key explanatory variables that should be used to understand the process of decision implementation.[57] Decisions made by official governmental action usually contain both objectives being sought and the assignment of resources to those personnel charged with the task of implementation. Furthermore, the model suggests that the interaction between and among the objectives and resources and four other variables determines the ultimate nature of the subsequent implementation. The four variables are: (1) inter-organizational communication and enforcement activities; (2) characteristics of the implementing agencies; (3) context variables of economic, social and political considerations; and (4) the personal disposition of the staff charged with implementation. Within each jurisdiction these four variables will probably assume different degrees of importance.

The Seismic Safety Elements illustrate the way in which the jurisdictions have implemented land use related seismic safety policy. We can also learn something about the pitfalls involved in implementing public policy. Appendix 4A presents the goals (or objectives) adopted in the various SSE's and our assessment of the extent to which these relatively modest goals have been implemented. It is clear from Appendix 4A that only a few jurisdictions have implemented even some of their objectives, while many have accomplished little. With the objectives in Appendix 4A in mind, we can turn to an examination and analysis of the resources supplied to those responsible for implementation of the land use objectives found in the Elements.

Resources

Allocation of monetary resources is an important indicator of the seriousness with which the jurisdictions have approached implementation of their land use objectives.[58] Dollars can be translated into additional staff to carry out objectives or to release existing staff for this work by hiring new employees to take over old responsibilities. Money also buys outside consulting assistance where necessary. We know of no jurisdiction that has added new staff specifically to implement the seismic safety related land use goals. Existing staff are usually expected to carry out the additional tasks. A partial exception occurs in some of the small jurisdictions which have decided to refer geologic and/or soils reports to outside private consultants for review and evaluation rather than hire staff with the appropriate expertise. Additional money is obviously spent here, but the sums are relatively small.

Virtually all jurisdictions have adopted Elements that recommend gathering more data about geologic conditions in areas that might be susceptible to earthquake damage. Money is clearly necessary to implement these data collection activities, and yet with the exception of a few occasions involving the construction of public facilities no jurisdiction has undertaken the kind of research discussed in the adopted Elements. The additional land use relevant data that has been collected has come from the reports submitted by private developers as part of the process for their building permit approval.

The allocation of non-monetary resources can also affect the quality of implementation efforts. While this kind of resource may have some indirect monetary link, the allocation of time for implementation of certain objectives by reordering priorities or the provision of incentives such as opportunities for advancement or special commendation are best thought of as non-monetary resources that a planning department, for example, might allocate to accomplish seismic safety objectives. Because monetary resources have not been increased, these non-monetary incentives could serve as an incentive to pursue land use goals related to seismic safety. It is essentially a matter of the legislative body or chief executive making such resources available, either through official channels or via the more informal "grapevine" that exists within every organization. In a word, non-monetary resource allocation requires the establishment by top-ranking authorities of a sense of importance and urgency about the accomplishment of certain goals. With the exception of Santa Rosa. Fremont, and sometimes Hayward, the jurisdictions studied have not attached much importance to the land use aspects of seismic safety and, therefore, the re-ordering of priorities and the allocation of the kinds of non-monetary incentives mentioned above has not taken place. In both Santa Rosa and Fremont, elected officials have given tacit and occasionally very explicit signs that some of the city's resources -- albeit non-monetary -- ought to be allocated to further land use objectives embodied within the SSE. Elected officials in Hayward have given similar indications with respect to land use planning on bay-fill land

We are not suggesting that all other jurisdictions forgot about their land use objectives. Rather, they have "chosen" to not allocate either monetary or non-monetary resources in a manner that would permit fulfillment of the adopted goals or, in most cases anything other than the most modest movement toward goal accomplishment.

An incident that occurred during consideration and finally passage of the Alameda County SSE provides a good example of the attitudes and actions being discussed in this section. It is not hard to understand why Alameda County has not allocated resources to implement its land use objectives when the Element's adoption was accompanied by the following. At the public hearings of both the Alameda County Planning Commission and the Board of Supervisors much of the public testimony and commentary centered around the "implementation" section of the proposed Element. Several representatives of those interests associated with land development -- realtors, contractors unions, etc. -- harshly criticized the proposals for implementation in the Element. In response, a planning commissioner characterized the SSE as "only a policy document" and that implementation was a different matter. In keeping with this philosophy, the Planning Commission adopted the SSE and sent it to the Board of Supervisors with the proviso that,

> ...nothing contained in the recommended element to the County General Plan shall be construed as suggesting or recommending any additional agency, laws, ordinances or legislation to those presently existing as necessary for the implementation of the policy set forth in the Element.[59]

While not specifically adopting that proviso, the Board of Supervisors' discussion of the Element prior to adoption left little doubt that the majority was sympathetic to these sentiments about implementation.

Given the modest land use objectives of most jurisdictions and given the even more modest or non-existent allocation of resources to fulfill the objectives, the level of accomplishment as indicated in Appendix 4A is not very surprising. An even fuller picture of implementation efforts emerges from a brief examination of the four other variables suggested by Van Meter and Van Horn, although the lack of resource allocation makes the explanatory relevence of the other variables relatively insignificant.

Inter-Organizational Communication and Enforcement

Implementation of most public policies requires the involvement of more than one public agency or set of officials. Seismic safety policy in land use planning is a good example. With a planning department taking the lead, several other units of local government must necessarily have a role.The legislative body and the chief executive (i.e., a city or county administrative officer) not only set official policy but also allocate resources and set priorities in their communications with planners. Planners must also communicate extensively with building department staff as any given proposed project moves toward final approval. Other local officials such as legal counsel and emergency service personnel, as well as private organizations such as utilities, are relevant in the implementation of seismic safety land use policy.

As indicated in our previous discussion of resource allocation, the communication from the legislative body and the chief executive of almost all jurisdictions has been rather clear: seismic safety should not be a high priority item of land use planners. Their tacit message is: do what is necessary to prevent some obviously poor land use decisions -- e.g., do not allow construction right on a fault -- but do not expend resources to fully implement the SSE. Coming from organizational units that are hierarchically superior to a planning department, this type of communication carries great authority.

Communication from building department officials and private developers and their consulting engineers and geologists also helps define the role of land use planning in a jurisdiction's seismic safety policy. Not surprisingly, private developers and their representatives are usually optimistic about their ability to construct structures that can cope with any "reasonable" expectation of earthquake magnitude. With the exception of those jurisdictions that have staff with pertinent expertise, such as Los Angeles City and County most jurisdictions seem to rely heavily upon the geologic and engineering analysis presented by developers.[60] Such reliance means that land use planners are usually persuaded by building deparment officials and private developers that projects can be adequately designed and built to account for any land related problems. These comments, of course, are generalizations and some important exceptions should be noted. Based primarily upon the special interest certain individual planning department staff might take in seismic safety, some planning departments have exerted themselves more in their relations with private developers and building departments; planning departments in Los Angeles City, Fremont and Hayward are notable in this respect. However, the more usual pattern of land use policy implementation is one in which the inter-organizational communication and enforcement efforts (such as they be) are characterized by a relatively low profile role for planning departments.

Characteristics of Implementing Agencies

Both planning and building departments have some responsibilities in implementing the land use policies found in most Seismic Safety Elements. As indicated above building departments seem to enjoy some prominence in their relations with planning departments. Yet within building departments, the staff assigned tasks involved with seismic safety measures is typically quite small in the larger jurisdictions and almost non-existent in the smaller jurisdictions. Building departments are primarily structured to check construction plans and to inspect construction in progress. Collection of geologic and soils information, let alone interpretation and analysis. for inclusion in land use planning is not seen as an important function for most building departments. Several building department officials indicated a desire to be more active in the seismic safety land use area but they unanimously pled insufficient resources to perform these functions often called for in the Elements. A very notable exception was found in Santa Rosa a topic to be explored in some detail in the subsequent chapter on building codes.

With the exception of a few planning departments that added a staff person during preparation of the Seismic Safety Element, none of the planning departments studied has added staff in order to monitor seismic safety matters. No planning department -- even the larger ones- -- has assigned any staff to work exclusively on seismic safety Seismic safety and the implementation of the SSE becomes simply one of the many new responsibilities that has been added to planning department tasks during the 1970's. Given the typical planning department's sensitive position in the local governmental hierarchy -- caught between the conflicting demands of local developers, citizens groups, elected officials and their own professionalism -- planners are not usually prone to initiate actions in new areas. Seismic safety, thus, remains low priority in the absence of directives and resources from above.

Political, Economic and Social Considerations

Without going into a full scale analysis of the political, economic, and social conditions within each jurisdiction, it is still possible to identify the kinds of constraints and potential opportunities these factors impose on efforts to implement seismic safety land use policy. For example, several of the research locales are "built up" communities with very little, if any, vacant land. Burbank provides a good example of this. Clearly, opportunities for significant action in the land use area are more limited in Burbank than in a developing city such as Santa Rosa or Fremont. Changing land use patterns in accordance with newly acquired knowledge about seismic safety problems is more difficult -- and costly -- after development has taken place than when the land is still undeveloped.

The full and vigorous implementation of the adopted SSE's land use recommendations would cost money, and in some cases a considerable sum. This alone has been a prime factor in the decision-making about implementation. Judgments based upon soils or geologic reports which address the appropriateness of a site for construction have serious economic consequences for the interested parties. Naturally, they will be pressing for the most favorable interpretation of the data and the most optimistic predictions about the consequences of an earthquake for their land. National traditions about the importance of private property rights, and the consequent right of a property owner to earn money from the land, combine to form a powerful presumption in favor of the development of private land with a minimum of public intervention. The amount of money at stake in land development heightens the presumption. De facto, issues such as seismic safety are on the defensive in land use decision-making.

Clashes between those with an economic interest at stake on the one hand, and the professional judgements of planners and the attitudes of some community groups on the other hand, can lead to arguments in the political arena before legislative bodies. As noted earlier in this chapter and in previous chapters, seismic safety occasionally becomes one of the focal points of political decision-making on development proposals.

With only a few exceptions that we have observed, these social, economic, and political considerations all point in one direction: implementation of seismic safety land use policies -- such as it is -- does not stand in the way of efforts to develop. Very few people or groups, if any, argue the case for seismic safety and, therefore, during the implementation phase the economic and social considerations in favor of development or against extensive governmental involvement for seismic safety purposes in the use of land will usually carry the day in the political realm.[61]

Personal Dispositions

The attitudes of staff and elected officials toward seismic safety's role in land use planning, and the Seismic Safety Element in particular will heavily influence the manner in which the Element is implemented. As we have already pointed out, planners tend to believe that engineers and building officials can "solve" any seismic related problems posed by a development proposal. At the same time, building department personnel do not see the land use related seismic safety matters as very important for them. These attitudes obviously affect the way in which these staff personnel approach seismic safety activities within their respective departments. These attitudes were widespread and we did not find any significant variations that could be explained by city size or previous experience with an earthquake.

Witness these commentaries by planners about the SSE of their jurisdiction and note the obviously low-level importance they attach to the Element, and, indirectly, to seismic safety in land use planning:

A. A past chairman of a large city's planning commission said that the SSE had not told him anything that was relevant for land use planning.

B. The planning department head in a large city said that he had not looked at the SSE in the four years since it had been adopted.

C. The planning department head in a medium sized city that had suffered some earthquake damage from the 1971 San Fernando earthquake was unable to find the SSE in his (small) office after a ten minute search. He then shrugged and said "Oh, well."

D. The head of "current development" in a planning department in a city which had suffered damage from a recent earthquake said that during the one year he had been on the job he had not seen nor read the SSE, and he saw no reason to do so because he felt he was performing quite well anyway.

The attitudes suggested by the above are typical and representative and have been presented here after a careful review of interview responses.

The exceptions to the above were found in the attitudes of a few planners and an occasional elected official. An example was the planner in a small city who perservered in the face of indifference until the city council allocated enough money to hire a consultant to write a technical section of the SSE. Another was the planner who recommended denial of a large subdivision proposal on grounds that the land was simple unsuitable for development because of potential landslides in an earthquake. However the dominant attitude of professional planners was a combination of indifference and resignation to a relatively low priority for seismic safety within traditional land use planning activities.

Given the virtual absence of resources allocated to implementing land use recommendations in the SSE's, the key variable in implementation becomes the personal dispositions of individual officials. Without money or official incentives only the strong personal commitment of individuals keeps seismic safety alive as an important factor in land use planning. With very few exceptions, we did not find such attitudes and, therefore, seismic safety has become one of a long laundry list of items that are involved in land development. The working of the other implementation factors of inter-organizational communication, character of implementing agencies, and the social, economic, and political considerations all contribute to the furtherance of these attitudes.

Summary Comments

It is clear that seismic safety has assumed a place on the local governmental planning agenda. The chapter has documented and characterized the nature of that role. The land use planning cases presented above illustrate some of the ways in which seismic safety becomes a planning issue. Most land use proposals treat seismic safety as "simply" a part of the usual planning process. Seismic safety is rarely accorded headline status. It is rarely the deciding point in a decision-making process, but it seems to have become a regular part of the decision-making process. This is especially true in any development proposals that involve the use of undeveloped land. Proponents of new projects on raw land routinely look at seismic safety as one of many concerns that must be addressed before final approval.

There is much in our research to support the assertion of a planning department director who characterized his city's Seismic Safety Element as serving a "red flag function." He meant that the material in the SSE serves as a reminder to staff that they should check on the seismic safety considerations in any development proposal that they perceive as possibly susceptible to earthquake damage.

The way in which seismic safety has become routinized as one of the many parts of a planning department's "check list" for development proposals is seen in the following two excerpts taken from Glendale Planning Department reports to their Planning Commission during consideration of development proposals:

> The site is on a level land underlain by alluvial soil that is suitable for residential construction. The Seismic Safety Element indicates that the project area is not subject to geologic or seismic hazards.[62]

> The site is located within the Hazard Management Zone in the Verdugo Fault Zone as enumerated in the Seismic Safety Element of the General Plan. A soils investigation should be conducted prior to project implementation in order to properly engineer the proposed development. The site is generally stable and provides an appropriate base for residential development provided that the structures are designed in accordance with appropriate seismic safety standards.[63]

In sum, we find that land use planning in our jurisdictions does take seismic safety into account, and undoubtedly there is an effort to avoid some of the more blatant and obviously poor planning decisions that ignored seismic consideration in prior years. At the same time, it is also clear that concern over seismic safety very rarely prevents a proposed development from gaining approval. Concern over the land use impacts of earthquakes has not reached a point where seismic safety questions play a dominant or even prominent role in most decisions. There exists a strong belief that most -- if not all -- seismic safety concerns can be "engineered away" in the design and construction of new buildings or renovation of old buildings a topic to which we turn in the next chapter.

APPENDIX 4A:

Land Use Recommendations Adopted in Seismic Safety Elements and the Record of Implementation

Burbank:

1. Appoint citizens task force on seismic safety.
   (Task force not appointed.)
2. Conduct geologic/seismological study of fault areas.
   (Study never undertaken.)

Glendale:

1. Require geologic/soils reports.
   (Usually required, especially for subdivisions)
2. No new construction over fault traces.
   (Accomplished.)
3. All subdivision plans reviewed by city government.
   (Accomplished.)
4. Evaluate the impact of creating a "multiple hazards zone."
   (Not done.)
5. Evaluate faults for recency of movement and more exact location.
   (Study never undertaken.)
6. Establish a Seismic Safety Element Review Committee.
   (Committee never appointed.)

Los Angeles City:

1. Improve procedures for collecing and organizing data relevant to seismic safety.
2. Permit no structures, including critical facilities across traces of active or potentially active faults.
   (Accommplished.)
3. Require geologic/soils reports within Special Studies Studies Zones.
   (Accomplished.)
4. Require geologic/soils reports in areas identified as potential problems.
   (Sometimes required; at discretion of city staff.)

Los Angeles County:

1. Collect and organize geologic information in more detail than existed. (Very little new data collected; no money appropriated for such research.)
2. Establish an inter-agency task force to expand the SSE and monitor seismic safety activities by the county (Not established)
3. Consider inclusion of seismic and geologic hazards in the county zoning ordinance (Not done.)
4. Amend ordinances to restrict certain land uses in dam inundation area (Not done)

San Fernando:

1. Refer those who apply for a building permit to the hazards map in the technical report of the SSE. (Permit applicants are usually told of the hazards map)

Simi Valley:

1. No critical structures on the Simi-Santa Rosa fault (Accomplished.)
2. Collect more information about the Simi-Santa Rosa fault. (Some effort toward this.)
3. Prohibit new construction across known faults (Accomplished)
4. Hire an engineering geologist to supervise all grading within the city (Engineering geologist not hired)
5. Review SSE annually and revise every five years (Informal review of the SSE.)

Santa Rosa:

1. Enforce the Alquist-Priolo Act on the Healdsburg-Rodgers Creek fault (Accomplished)
2. Require slope stability analysis in landslide prone areas (Analysis is required)
3. No critical facilities within the Special Studies Zone (Hospital expansion and new public safety building within the SSZ because no fault trace found by trenching.)

4. Gather more precise data on the Healdsburg-Rodgers Creek fault, landslide areas and liquefaction areas.
   (Nothing done other than required trenching.)
5. Periodically update SSE.
   (Nothing done.)

Alameda County:

1. Require soils report and geologic report when deemed necessary by building official.
   (Done according to official's discretion.)
2. Collect more data on seismic problems of undeveloped land.
   (Very little data collected.)
3. Organize seismic safety related data into a central file.
   (Not done.)

Berkeley:

1. Enforce the Alquist-Priolo Act on the Hayward fault.
   (Accomplished, although most structures are single-family residences and therefore exempt.)
2. Adopt rules similar to those for the Special Studies Zone outside of the Zone.
   (Not done.)
3. Acquire lands subject to high seismic risk.
   (Not done.)

Fremont:

1. Require geologic reports on land identified in SSE as having potential hazard.
   (Accomplished.)
2. Organize and centralize information about geologic hazards in the city
   (Partially accomplished.)
3. Avoid construction in areas of high probability of damage from liquefaction.
   (Partially accomplished.)
4. Avoid problems associated with surface fault rupture.
   (Accomplished within the Special Studies Zone.)

Hayward:

1. Within Special Studies Zone require extensive soils and geologic reports and permit no structures across fault traces.
(Accommplished.)
2. Outside Special Studies Zone require soils and geologic reports for developmments of buildings 50 feet or higher and for high occupancy structures.
(Accomplished.)
3. Building offical should require soils and geologic reports whenever he feels it appropriate.
(Occasionally required)

Oakland:

1. Require what the Alquist-Priolo Act calls for within the Special Studies Zone.
(Accomplished, with most emphasis on setback from fault.)
2. Collect and monitor geologic data
(No systematic data collection program; only information supplied incidentally.)
3. Discourage development on slopes greater than 30°.
(Occasionally followed; several notable exceptions.)
4. Prohibit new critical facilities in any hazardous areas. (No critical facilities in hazardous areas have been proposed.)

Salinas:

1. Require soils and geologic report in high hazard areas.
(Required occasionally.)

CHAPTER 4

Footnotes

[1] Jeffrey Pressman and Aaron Wildavsky. Implementation. Berkeley: University of California Press, 1973, p. 109.

[2] Euclid v. Ambler Realty Co., 272 U.S. 365. Although this case involved a dispute over the right of Euclid, Ohio to zone Ambler's land to preclude certain uses, the larger implications of this case were clear: a local jurisdiction, acting in accord with state law, may protect the health, safety and welfare of its citizens by planning the use of land and enforcing such a plan with appropriate zoning. We do not distinguish between planning and zoning in our presentation. We use the terms "land use planning" in its broadest sense.

[3] William Spangle, "Post-Earthquake Land Use Planning," paper presented to the Natural Hazards Reduction Conference, University of Colorado, August, 1978, p. 1.

[4] Seismic Safety Commission, State of California, "Goals and Policies for Earthquake Safety in California," Sacramento, May 1979, p. 16.

[5] The Seismic Safety Elements discuss building codes and emergency response planning in addition to land use. While all these topics are interrelated, this chapter only looks at the land use aspects; subsequent chapters discuss building codes and emergency planning.

[6] This statement is taken from the introductory pages of the proposed new General Plan guidelines. State of California, Office of Planning and Research, "General Plan Guidelines," (Review Draft), January, 1980, p. xiv.

[7] A partial exception is Salinas, which did rely upon some technical work performed for Monterey County.

[8] Until 1975 the Council on Intergovernmental Relations was charged with the responsibility of preparing General Plan guidelines. The function was transferred to the Office of Planning and Research, a unit of the Governor's office, as per Government Code Section 65040.2.

[9] State of California, Council on Intergovernmental Relations, "Guidelines for Seismic Safety Element," September, 1973. These guidelines have been replaced with a

new version. The new guidelines, developed by the Office of Planning and Research, are not relevant for our research because they were promulgated after our jurisdictions adopted their Seismic Safety Elements.

[10] Ibid. Commentary in the Guidelines relative to the issues of buildings and emergency preparedness are included here so that the full thrust of the Guidelines may be appreciated. However, our only concern in this chapter remains land use matters.

[11] State of California, Seismic Safety Commission, "A Review of the Seismic Safety Element Requirement in California," June 9, 1977. See especially Appendix B.

[12] In order to assist the authors in an understanding and evaluation of the technical information contained in the SSE´s, we secured the services of Professor Authur Sylvester, Department of Geological Sciences. University of California, Santa Barbara. Professor Sylvester read each Element and prepared a short critique for the authors. His comments served as an important input to our understanding and evaluations, but, of course, we alone assume responsibility for this discussion. Information about SSE´s was collected in 1978 and 1979. Events, actions and reports subsequent to that time have not been utilized in this analysis.

[13] City of Burbank, Seismic Safety Element, 1972, p. 3.

[14] Ibid.

[15] City of Glendale, Seismic Safety Element, 1975, p. 3.

[16] Ibid, pp. 13, 14.

[17] "Seismic Safety Analysis: City of Los Angeles," prepared by J.H. Wiggins Co. for the City of Los Angeles, 1974.

[18] City of Los Angeles, Seismic Safety Plan, 1975, p.2.

[19] County of Los Angeles Seismic Safety Element, 1975, p. 24.

[20] Ibid., p. 26.

[21] Ibid., p. 53.

[22] "Report of Seismic Hazard for the City of San Fernando," Woodward-McNeill and Associates, 1973.

[23] _Ibid_., p. 3 (emphasis in original).

[24] City of San Fernando, _Seismic Safety Element_, 1974., p. 11.

[25] The public safety portion deals with fire and flood hazards and is not relevant for our concern.

[26] The consultant used the 1940 El Centro earthquake as the basis for his model.

[27] City of Simi Valley, _Seismic Safety and Public Safety Elements_, 1974, pp. 2,3.

[28] _Ibid_., p.21.

[29] City of Santa Rosa, Seismic Safety and Safety Elements, 1976, pp. 2,3.

[30] _Ibid_., p. 20.

[31] _Ibid_., p. 39.

[32] _Ibid_., p. 31.

[33] _Ibid_., p. 120.

[34] County of Alameda, _Seismic Safety Element_, 1976, pp. 2-25.

[35] City of Berkeley, _Seismic Safety/Safety Element_, 1977, p. 58.

[36] _Ibid_., p. 59.

[37] _Ibid_., p. 60.

[38] City of Fremont, _Seismic Safety and Safety Element_, p. 8.

[39] _Ibid_., p. 40.

[40] City of Hayward, _Earthquake Study_, 1972.

[41] City of Oakland, _Environmental Hazards_, 1974.

[42] Ibid., p. 43.

[43] Ibid., p 46.

[44] City of Salinas, Seismic Hazards Technical Report, p. 23.

[45] Aaron Wildavsky talks about the difficulty of knowing the objectives of any public policy. As he says, policy objectives may be "multiple, conflicting, and vague." The first step of a researcher "must be a search for objectives against which to evaluate the program." In our case, the recommendations in a Seismic Safety Element become the policy objectives once they are formally adopted by a jurisdiction. Yet, we are fully aware that some of the political actors involved would be unwilling to agree that the adopted Element is official policy. This view is not convincing to us. For a more thorough discussion of this issue, and the source of the above quotations, see Aaron Wildavsky, Speaking Truth to Power. Boston: Little, Brown, 1979, pp. 215-216.

[46] California, Public Resources Code, Sections 2621-2630. Other instances where the state has retained its prerogative in land use planning are nuclear power plant siting and coastal zone planning.

[47] Ibid., Section 2621.5.

[48] Ibid., Section 2622

[49] Ibid.

[50] Ibid., Section 2621.6.

[51] Ibid.

[52] California, State Mining and Geology Board, "Policies and Criteria of the State Mining and Geologic Board with Reference to the Alquist-Priolo Special Studies Zones Act." Adopted in 1973 and revised 1974 and 1975.

[53] Another concern that some officials have is the feeling that some geologic reports may not be as thorough as desirable. Several developers complained about the time necessary to review the geologic reports and the way in which the lay public attempts to use the reports to block certain projects.

[54] Risa Palm, "Public Response to Mandated Earthquake

Hazard Disclosure by Real Estate Agents," paper presented at the Third International Conference: The Social and Economic Aspects of Earthquakes and Planning to Mitigate Their Impacts, Bled, Yugoslavia, June 29 - July 2, 1981, p. 11.

[55] Some of this discussion benefits from reading of a report by William Spangle and Associates, Land Use Planning After Earthquakes. Portola Valley, California, 1980. Spangle also points out the lack of land use changes in San Fernando after the 1971 earthquake.

[56] Ibid., p. 11.

[57] Donald S. Van Meter and Carl E. Van Horn, "The Policy Implementation Process: A Conceptual Framework," Administration and Society, 6 (February, 1975), pp. 445-488.

[58] No city or county budget adopted during the study period contained specific references to appropriations for any seismic safety activity except preparation of the SSE. This forces us to rely upon interviews and observations for a discussion of resources.

[59] Minutes of Alameda County Planning Commission, September 29, 1975.

[60] This comment represents a judgment based upon our extensive interviews. To be sure, several jurisdictions seek occasional guidance from private consulting experts.

[61] A social issue not mentioned here is a community's need for housing. The pressure for more dwelling units is a powerful force that can undermine caution based on potential earthquake damage and loss.

[62] City of Glendale, report to Planning Commission regarding Tract #3363, found in minutes of the City Council, June 13, 1977.

[63] City of Glendale, Planning Department staff report on Tentative Tract #32801, July 20, 1976.

CHAPTER FIVE

Building Codes and Seismic Safety

The ultimate goal of all seismic safety efforts is to save lives in the event of an earthquake. Attaining that goal depends largely upon the performance of structures subject to earthquake forces. Buildings, roads, bridges, dams, utility facilities, and other man-made structures pose the greatest threat to life during a seismic event. A recent report from the Office of Science and Technology, Executive Office of the President, makes this point quite emphatically:

> Deaths and injuries result from the failure of man-made structures in earthquakes. In the United States and much of the world, 90 percent of the loss of life in earthquakes and a major part of the economic loss has been due to the failure of weak structures.[1]

Land use planning -- deciding where to place structures -- can play a role in seismic safety, and we have examined that role in the preceding chapter. Clearly, an effort to mitigate earthquake hazards must also be attentive to the design and construction of structures. Quoting again from the just mentioned report, "Past history shows that properly designed and constructed facilities can withstand major earthquakes."[2] However, it should be quickly noted that the task of designing and constructing structures that will survive major earthquakes without <u>any</u> damage may be an illusory and perhaps misleading objective. The appropriate goal is more modest and realistic, as indicated in this statement from a research report prepared by the American Institute of Architects:

> Because of cost considerations, technical feasibility, or perhaps simply because sooner or later an earthquake will occur which exceeds our design assumptions, it is probably not possible to design an earthquake damage-free or zero-risk building. Hence we say earthquake resistant not earthquake proof.[3]

We now turn our attention to a major component of the structural hazard reduction effort -- building codes and their enforcement. Seismically relevant building codes are a subset of the more general building codes.

This statement by the Advisory Commission on Intergovernmental Relations about building codes demonstrates the similarity in the goals of all building codes:

> The object of building codes is to protect the public against faulty design and construction of buildings. The building code must insure that occupants, adjoining properties and neighbors, and passers-by are protected from the erection of structures that are likely to collapse or lead to unhealthy or unsanitary conditions.[4]

In this chapter we examine the development, enactment, and enforcement of building codes designed to improve seismic safety. Because local government has little or no responsibility for structures such as dams, freeways, and utilities, we will concentrate only on buildings. The chapter starts with a brief background discussion about building codes in California. We then turn to an examination and analysis of the building code recommendations adopted in the Seismic Safety Elements. The next section discusses some of the problems and issues traditionally raised about building code enforcement and the characteristics of building code implementation in our research jurisdiction. The final section of this chapter discusses some policy responses to the hazards posed by older buildings in five jurisdictions.

Building Codes in California

Local governments in California use the model building code developed by the International Conference of Building Officials. The model code is called the Uniform Building Code (UBC) and is one of four model building codes used in the United States. With the motivation provided by both the 1925 Santa Barbara earthquake and the 1933 Long Beach earthquake, the period before World War II saw the UBC begin to incorporate building design requirements to account for seismic generated forces. Because of the extensive damage done to Long Beach schools in 1933, special building code requirements for schools were also enacted by the state legislature.

The legal authorization for imposition of building codes which include seismic design criteria can be found in the California Health and Safety Code. The state has established the legal requirement that local jurisdictions use the UBC seismic design standards or standards even more stringent. In a chapter on "Earthquake Protection" in the Health and Safety Code the relevant sections read as follows:

> Every building or structure and every portion thereof shall be designed and constructed to resist stresses produced by lateral forces as provided in the State Building Standards Code."[5]
>
> Any city, city and county, or county may establish by ordinance construction standards higher than those established by this chapter.[6]
>
> The Building Department of every city, city and county, and county shall enforce this chapter within the city or city and county.[7]

The State Building Standards Code referred to above is established by the State Building Standards Commission. As a practical matter, the State Building Standards Code is the UBC for seismic design purposes.[8]

All the jurisdictions included in this research use the UBC except the city of Los Angeles, which has developed its own code. With respect to seismic design requirements, the Los Angeles code is similar to the UBC and perhaps somewhat more stringent. There is frequently a time lag between publication of a new UBC edition and formal adoption of the new version by local governments. This time lag can be as long as two or three years in some instances. However, we have not seen any efforts to purposely circumvent the adoption of a new UBC; eventually all jurisdictions adopt the latest version. Delays in adopting a new UBC version do not stem from controversy over the seismic design features of the code.

A building is subjected to various types of ground movement during an earthquake. Therefore, the heart of the seismic design section of the UBC is the criteria that must be used in designing a building to withstand the lateral forces created by an earthquake. The precise design criteria are not relevant to this research, but it is noteworthy that the criteria have become more stringent. That is, a building constructed in 1980 must be capable of withstanding greater lateral forces than a similar building constructed as recently as 1970.

Any discussion of seismic building codes must point out important qualifications about the relationship of building codes to design and construction. Significant advances in knowledge about what an earthquake does to variously designed buildings comes primarily from investigations after major earthquakes. The advancement of that knowledge does not always proceed rapidly because major earthquakes (of the kind experienced in California) in locations having buildings designed similarly to those in California do not occur frequently. Progress, then, is sometimes controlled by the forces of nature. The UBC is periodically revised to reflect recent earthquake experience.

Without a doubt, today's building code requirements help produce buildings that are more earthquake resistant than those constructed several decades ago. But the UBC's precise formulas and specifications can create a misleading picture of both the state of knowledge about what an earthquake does to a building and of the actual quality of new buildings. Structural engineers and architects will admit that they still have more to learn about designing buildings for earthquake performance. It is also clear that despite the improvement in design requirements some new buildings which meet the UBC "on paper" will suffer damage from a future earthquake. A comment by John Blume, past president of the Earthquake Engineering Research Institute, about the consequences of the 1979 Imperial Valley earthquake indicates the less than perfect state of the art:

> Somehow the message and the warnings have not always seeped through. In spite of all our modern codes and computers and our mathematical refinements, a seismic design still remains in large part an art in which good judgment, a "sense" of structure, and good construction are essential ingredients.[9]

Building Codes and Old Buildings in Seismic Safety Elements

With the sole exception of Salinas, every SSE contains recommendations pertaining to the structural integrity of buildings.[10] (See Appendix 5A for the specific recommendations.) These adopted recommendations include proposals for research and further study on building safety as well as proposals for specific actions that should be taken to abate existing structural hazards and prevent future ones. Most SSE's indicate an intention to continue the process of adopting revisions in the UBC. Additionally, the city and county of Los Angeles both adopted recommendations stating their intention to lobby with the state and federal governments for improved seismic design criteria on state and federal buildings located within the city and county.

The most common subject in SSE recommendations about building integrity is the "old buildings problem." These pre-1933 buildings, usually of unreinforced masonry construction, pose a serious threat of collapse in a moderate or strong earthquake. Virtually every jurisdiction in our research has some of these buildings, and some jurisdictions like the city of Los Angeles may have thousands. Every SSE contains a recommendation that the city or county evaluate and study the nature of the old buildings problem in its jurisdiction. This is a clear call for a systematic engineering survey of older buildings. Furthermore, every SSE recommends the abatement of buildings found structurally deficient as a result of the survey; demolition or rehabilitation are mentioned. In other words, official policy in all jurisdictions calls for a study of the general problem and then an elimination of whatever specific problems are found to exist.[11]

Only the cities of Santa Rosa and Los Angeles have undertaken the systematic evaluation of older buildings as called for in their Seismic Safety Elements. These two jurisdictions, both of which have had damaging earthquakes in recent years, have also undertaken an old building abatement program. Los Angeles´ program is new while Santa Rosa´s has been underway since 1971. As indicated in Appendix 5A, the other eleven jurisdictions have done virtually nothing to implement the old buildings´ policies adopted in their SSE´s. A few jurisdictions (e.g., Hayward and Berkeley) have conducted "windshield" surveys in which a building inspector drove around the older sections of the city and made informal observations about the presence of potentially hazardous older buildings. However, these eleven jurisdictions have not allocated any resources nor established any specific standards for defining what constitutes a dangerous old building.

Implementing Building Codes

Implementation of building codes is more commonly called "code enforcement." This section uses the terms "implementation" and "enforcement" interchangeably. We start with a general discussion of possible building code enforcement problems, without specific reference to our research jurisdictions, and then move to a consideration of building code implementation in the thirteen jurisdictions.

Enforcement Problems in General

While the overall goal may be the construction of earthquake resistant buildings as a way of saving lives and limiting property damage, the enforcement of building codes is fraught with potential problems that may impede progress toward that goal. Some of these potential problems will be discussed in more detail subsequently, but a general commentary on them at this point will be helpful. Four potential enforcement problems deserve mention: (1) misunderstandings, (2) discretion/flexibility, (3) inadequate review and inspection, and (4) corruption.

The most perfectly written code is only as good as the extent to which it can be understood by those charged with enforcing it. Some aspects of the UBC design requirement are complex and they have undergone several changes in the last decade or two. It is possible, then, for honest misunderstandings to creep into code enforcement at both the plan review and the on-site inspection stages of enforcement. Other than the comments of a few architects and contractors, we have no evidence about the extent of this potential problem. However, a few comments have surfaced about disagreements between local building officials and architects or contractors over the meaning and application of the UBC. The extent of our data is so limited that it is impossible to form a judgment about whether it is the private sector or building officials who are not correctly interpreting the code.

No one disagrees with the need for discretion and flexibility in the administration of the UBC. Local building officials must have discretion because the code cannot possibly cover <u>every</u> conceivable situation. Furthermore, several Seismic Safety Elements and many local ordinances specifically call for judgments by building officials on such things as soils and geologic reports, and the meaning of these reports for the design of a particular building. Despite the need for flexibility, the vesting of discretionary judgment in the building official means that there will be occasions when the judgment is less than adequate. Ordinary human fallibility or, perhaps, incompetence can lead to buildings that are "improperly" designed or constructed. In a word, discretion increases the risk that poor judgment may be exercised. On the other hand, no one can legitimately claim that the codes and implementing ordinances can be written in a manner that eliminates the need for discretion. More than anything, what this point should highlight is the important role played by local building officials and why the job calls for experienced and competent individuals.

Less than an adequate review of plans or construction is also possible. This potential problem can arise from an inadequately trained staff or incompetency by staff members.

Understaffing stands out as a more frequent cause of inadequate plan review or on-site inspections. Virtually every building official interviewed reported understaffing as a concern. Some building departments have witnessed large increases in workload while at the same time being forced to reduce staff size. Understaffing is simply another way to indicate that building department staff are often overworked. California is probably no different than the national trend as indicated in a U.S. Department of Justice report which concluded that "Given the variety and complexity of responsibilities imposed by the various codes, it is safe to say that [building] inspectors are overworked, particularly in rapidly growing areas."[12] The report went on to conclude also that "If inspectors are overworked, they are also poorly paid, particularly in comparison with the construction workers they supervise.[13]

Any time a governmental official has the legal authority to make discretionary decisions based upon the application of general rules to the particulars of a specific case, the possibility of corruption exists. The possibility of corruption is enhanced when these decisions may have a significant economic impact upon private individuals. Because these conditions prevail in the process of building code enforcement, corruption is a potential problem. Corruption may be either bribery or extortion and it may involve either monetary transactions or the exchange of non-monetary services or favors. There have been allegations of fairly widespread corruption in the enforcement of building codes in the United States; some of these allegations have been adequately demonstrated in judicial proceedings.[14] This current research did not plan to focus on corruption and we have not come across any. However, the reason for discussing corruption is obvious. Since seismic building codes add some complexity and some cost to the design and construction of buildings, they present a possible incentive for illegal activities. Any such activities would pervert the code's goals and thus we recognize their importance even if this research does not deal with it.

Having now provided some background about potential enforcement problems, we now turn to some specific aspects of code implementation in the research jurisdictions.

Characteristics of Building Departments

Some of the organizing characteristics and operating procedures of a city or county building department affect the quality of seismic safety policy implementation. With the exception of the city of Los Angeles, all jurisdictions in this research utilize the Uniform Building Code, but the way in which this code and other relevant policies such as the SSE are implemented varies considerably. The building department's placement within the governmental organization chart, the kind of personnel who staff the agency, practices for reviewing plans and inspecting construction, and procedures for learning about changes in codes or technology are the kinds of agency characteristics that may make a difference in implementation.

The building departments in our research vary in size from the very small San Fernando operation of two persons to the large complex organization of the city of Los Angeles with approximately 850 people and the county of Los Angeles with a net department budget of over $32 million for fiscal year 1980-81. While most building departments grouped in the 2-40 person size range, it is clear that size, organizational complexity, and budget create building inspection "environments" that are entirely different. Most building departments have autonomous organizational status and report to the city manager. However, there are some important exceptions in Los Angeles County and Alameda County. The Los Angeles County Division of Building and Safety is an organizational sub-unit of the County Engineers Office and Alameda County's Building Department is located within the County Public Works Department. Theoretically, this organizational arrangement might give these two building departments less access to top administrative leadership and a reduced prominence in the governmental hierarchy. We found no evidence, however, that organizational location had any impact on building department operation, including implementation of seismic safety policy.

Only the building departments of Fremont, San Fernando, and Salinas did not have personnel with an engineering degree on the building department staff. The remaining ten building departments all had at least one resident staff member with a degree in civil engineering. At a further level of expertise and specialization, Los Angeles City, Los Angeles County, Berkeley, Glendale, Santa Rosa, and Simi Valley all had at least one staff member with structural engineering expertise. Of the jurisdictions which have not had a recent earthquake, only Berkeley has chosen to employ a structural engineer. San Fernando and Burbank are the only two jurisdictions with recent earthquake experience not to have a structural engineer on staff. Assuming for the sake of discussion -- and we have no evidence to the contrary -- that all of the engineers are well-trained and competent professionals, their expertise allows the local government to check the accuracy, appropriateness, and code compliance of more complicated building designs.

Those building departments without any engineers on staff use outside consultants for review and comment whenever they have plans for an engineered building submitted to them. Some jurisdictions such as Salinas employ a few private engineers to provide this service. Several other jurisdictions without engineers, and even some with engineers when they are faced with an especially complicated design, seek review and comments from the International

Conference of Building Officials organization. Outside review has its advantages when a jurisdiction simply cannot assess a set of plans submitted by a developer. However, the use of private consulting engineers can also raise questions because of the possible hesitancy of a private engineer to be too critical of the fellow engineer who developed the original plans. Some outside engineers have not only served as consultants for a city in reviewing plans, but have also submitted their own plans prepared for a client to the very same city. Not surprisingly, these building departments who utilize outside consulting engineers for plan review denied that anything but the most thorough and unbiased review was performed by their consultants. However, the practice of using consulting engineers was questioned by some private architects and developers during interviews with them. Clearly, a jurisdiction without staff competent to review certain types of building plans has no choice but to seek outside advice. Problems with the practice are quite possible.

The plan review process highlights the important discretion that building departments exercise and how that discretion may affect seismic safety and the intent of the building codes.[15] For instance, virtually all building departments have developed an informal practice for reviewing the plans for single-family residences. Such plans are not reviewed very thoroughly and are usually not checked carefully for compliance with seismic safety provisions of the code. It is typically argued that the seismic code provisions for single-family residencies are very simple and straight-forward so that only the most cursory check has to be performed. This practice was buttressed by the oft-repeated statement that nothing very serious could happen to single-family homes during an earthquake so a careful review of plans was not a sensible or efficient use of building department staff time.

The same attitude is carried over from single-family homes to the plan review process for multiple-family and commercial structures in all but the few large building departments. A common practice is referred to as "eyeballing" the submitted plans. That is, the plans are frequently given a perusal and the actual calculations used in developing the plans are usually not redone to verify their accuracy. Time pressures resulting from a perceived shortage of building department staff is the reason most cited for this practice in the small and medium-sized departments. Apparently, only those developers or architects who have acquired a reputation for less than full professional competence will have their plans checked from the very first calculation to the last little detail. And, of course, on any proposed structure of any complexity, those departments without structural engineering expertise will usually seek an outside consultant's advice. Notice the room for discretionary judgments about how to process and review a set of plans.

No building department has a formal in-service training program related to seismic safety matters. Several department heads expressed the opinion that such a program was unnecessary because code changes and advances in technology were not that frequent or dramatic. One department head of a medium-sized agency responded to a question about how he and his staff kept current with codes and technology by saying "I just read the code. Nothing new or complicated is ever added so there is really no need to learn new things." While not expressing themselves quite as explicitly or strongly, most building department heads saw little reason to participate actively in engineering conferences or associations. There are a few glaring exceptions to the above generalizations in jurisdictions such as Los Angeles City and Los Angeles County, where there appears to be a commitment to professional development and involvement. Indeed, several staff members of these two departments are active in the process of revising the UBC every few years. The heads of a few other departments (Alameda County, Glendale, and Hayward) stressed their membership in professional associations and attendance at conferences as the way they learned about new ideas and technology. Yet, it is clear that except for these types of exceptions most building departments are staffed with individuals who see no need to advance their professional qualifications with respect to seismic safety matters.[16]

Virtually every building official interviewed complained of the difficulty they faced in finding and keeping competent staff members. Building departments are characterized by frequent turnover in staff, particularly when private sector construction activity is high. The private sector generally pays more and building department staff are apparently good recruitment targets. The resulting turnover means that building departments usually find themselves staffed with a certain percentage of newcomers. This may hinder full and successful implementation of seismic safety provisions, as well as the UBC generally.

Personal Dispositions

The attitudes of building department officials toward the seismic safety aspects of their role help condition their approach to seismic safety policy implementation. Based upon interviews with building officials in all thirteen jurisdictions, interviews with developers, contractors, and architects in the jurisdictions, and scrutiny of numerous official documents, a composite characterization of these attitudes begins to emerge.

Generally, building officials do not rate seismic safety as an important community issue. Neither do they rate seismic safety as an important, difficult, or time consuming function of their own agencies. Most building officials, in large as well as smaller departments, viewed the seismic safety sections of the UBC as relatively easy to understand and no more difficult than other parts of the code. Seismic safety related plan checking and on-site inspections were typically described as "routine" and "no different" than what was required for other UBC sections.

This set of attitudes may stem from the relatively recent addition of upgraded seismic safety UBC provisions. The relative newness also corresponds to a time period in which building officials perceived that their workload was increasing. Continued increases in construction during the last few decades coupled with less than comparable increases in staff caused most building officials to say they and their personnel are overworked. Therefore, any "new" UBC approaches to seismic safety, such as those incorporated after the 1971 San Fernando earthquake, are not perceived as terribly important or different, at least partly because of the rush of activities in building departments. It should be remembered that most building officials do not perceive very much risk to their community from an earthquake.

When considering the potential problems posed by older unreinforced masonry buildings within their jurisdiction, building officials generally express a reluctance to undertake abatement steps. Several building officials simply do not perceive older buildings as a serious problem, but the most common reason advanced for inaction is a belief that the social and economic costs and disruption exceed the possible benefits. A common theme voiced by most building officials is that "natural attrition" will solve any possible problem from older buildings as the private sector makes market oriented decisions to replace or rehabilitate old buildings. In any event, with only a few exceptions, building officials disavow any interest in tackling the older buildings issue.

Two important exceptions, in the city of Los Angeles and in Santa Rosa, demonstrate the importance of attitudes held by key staff personnel. Santa Rosa city government has several individuals, particularly those associated with the building department, who view their city's efforts to replace old structurally unsound buildings with something approaching missionary zeal. Following the 1969 Santa Rosa earthquake, they began vigorous implementation of a local law requiring rehabilitation or demolition of many older buildings in the downtown area. They were able to take advantage of an urban renewal project underway in an adjacent area by convincing the federal government to expand the original project boundary lines to include the area containing most of the older buildings. Resisting the initial heavy opposition were several city officials who personally believed the unsound buildings must be fixed. Over the last ten years, a small number (3-6) of city staff members and a few elected council members have persevered in supporting implementation efforts because of their own convictions and not because of any visible public demands or obvious political benefits.

The same may be said about Los Angeles, although some modest public support for seismic safety came from a few professional associations (e.g., structural engineers) and the local press. Nevertheless, it has been the determination of a few city staff members that has accounted for the reasonably successful implementation of the 1975 city Seismic Safety Element. For example, the Seismic Safety Element called for the adoption of a law requiring the identification and rehabilitation or demolition of structurally unsound old buildings. Six years after making a commitment to implement such a policy the city council actually did so. Those intervening years were noteworthy for the delays cause by the ever-intense opposition to such a law by the owners -- and sometimes the tenants -- of the 14,000 buildings possibly affected by the original version of the ordinance. At numerous points during the six year controversy it would have been possible to abandon the effort without anyone suffering political repercussions or embarrassment. Only the strongly held beliefs of a few council members, mayor's office personnel, and especially some high ranking city staff members kept the matter alive and eventually completed.

Inter-Agency Communication

The lead agency in building code implementation is the city or county building department. These departments are involved in the daily activities of reviewing building designs and inspecting buildings under construction for compliance with the UBC. When it comes to the seismic provisions of the code, building departments have little reason or occasion to interact with other agencies. As a result, the quality of implementation is not seriously affected by the absence of inter-agency communication.

A few opportunities for interaction arise, however. Building departments sometimes find themselves discussing seismic code provisions with planning or redevelopment department officials or, in larger jurisdictions, with officials involved in the construction, maintenance, or repair of public buildings. During these relatively infrequent interactions, the building department personnel serve in the capacity of providing expert commentary about building codes while staff from other agencies are cast in the role of seeking advice. The building department staff predominant because of their expertise.

Political and Economic Considerations

Several political and economic characteristics of building code implementation contribute to a low visibility status for this activity. The UBC and its enforcement do not usually generate public controversy. While there may be some conflict over the particulars of new code sections while they are being considered, any conflict over the actual implementation of the code is almost always confined to the building department and specific developer or contractor involved. This is as true for the seismic provisions of the code as for any other section. The low visibility means that little politically overt activity occurs. Only rarely is a political official or top level administrator involved in the implementation of the UBC.[17]

All of the research jurisdictions showed these tendencies with respect to overt political activity in building code implementation. And yet politics has a certain role in building code implementation, albeit more indirect and subtle. There have been occasions, for instance, when elected officials will make an "inquiry" to the building department about why a particular project is having trouble getting department approval. While we know of no instance where the subject of the inquiry was the seismic provisions of the UBC, it must occasionally happen. A better example of how subtle political considerations in the informal setting of priorities can influence the implementation activities of a building department is furnished by examining the fate of a dangerous building appendage (parapet) program in Berkeley. In the mid-1970's the Berkeley Housing and Development Department, Building Inspection Division, decided to survey a section of the city where it suspected many older buildings might have parapets ready to fall in an earthquake. After identifying approximately 100 buildings that should have some work done to their outside appendages, the city slowly started working with the building owners. Outside of the building department officials, no one in city government nor anyone active in city politics gave much attention to this program. In the face of some building owner resistance and limitations on the department's time and staff, and without any augmentation of its resources, the parapet program slowly withered on the vine. No one said "Kill that program." Rather, it seems to have died from inattention and greater importance being attached to other activities.

In the total absence of any seismic provisions in the UBC it is probable that building costs would be less than they are today with the provisions in place; how much less is not relevant to this discussion. Given that the code increases the cost to construct a building, it might seem reasonable to predict that contractors, architects, developers, and real estate agents would resist the seismic code, seek ways to circumvent it, and encourage the building departments to be very lenient in their implementation. No evidence of these attitudes or actions was uncovered.[18] To the contrary, respondents from the construction industry and building department personnel all indicated that the costs associated with the seismic provisions were not a point of contention between the department and permit applicants. Likewise, architects reported that the additional building costs associated with seismic safety virtually never became an issue for their clients. It seems safe to conclude that economic considerations are not an important factor in the application of seismic code provisions to new buildings. As we will see in the next section of this chapter, however, economic factors do play a major role in efforts to address the problems posed by older buildings.

The Problem of Older Buildings

Buildings constructed before 1933, especially if they are of unreinforced masonry construction, are usually considered potential hazards. Prior to that year the building codes did not contain seismic provisions. In the event of even a moderate earthquake, it is widely assumed that many of the old unreinforced masonry structures will collapse, with a resultant loss of life for building inhabitants and perhaps passersby.[19] Most California cities contain a number of these older buildings, but, of course, the older cities tend to have a higher percentage of them. The city of Los Angeles has identified approximately 8,000 unreinforced masonry buildings; few other jurisdictions have undertaken a systematic survey of their building stock in order to produce a precise inventory of older buildings. It has been estimated that in the event of a 6.0 magnitude earthquake, approximately 7,000 death and 26,000 injuries would be attributable to the failure of these older buildings in Los Angeles.[20]

The extent of possible life loss, injuries, and property damage due to the older buildings easily justifies a closer look at what a few jurisdictions have done about the problem. We can also look at few cases where there is ample evidence of an older building problem, but little or nothing has been done to abate it. Brief case studies will be presented to highlight the various approaches taken by the city of Los Angeles, Santa Rosa, Burbank, Oakland, and Salinas. We will show how the first two jurisdictions have attempted to ameliorate the problem, while the latter three have chosen not to adopt any policy; they have taken the option of "natural attrition."

Los Angeles

As in other aspects of seismic safety policy, the city of Los Angeles is often looked to for leadership in the area of building codes and their enforcement. Part of the reason for this leadership role is the relatively large city staff with expertise and responsibility in this area. Another reason is the general support for over-all seismic safety goals given by at least a majority of the city council over the last decade. Culminating approximately seven years of discussion and controversy, the Los Angeles City Council adopted an ordinance in January, 1981 that sets in motion the rehabilitation of approximately 8,000 older, unreinforced masonry buildings withing the city. After presenting a summarized chronology of events leading up to the passage of the ordinance, we discuss some of the factors that shaped the final version of the policy:[21]

1974 -- City Council holds first discussion about the problems posed by old buildings.

1976 -- City Council defeats effort to require owners of pre-1933 buildings which house or are used by 100 or more persons to bring them up to current code or demolish them.

1976 -- City Council's Building and Safety Committee recommends a policy requiring the rehabilitation of all unreinforced masonry buildings, but the Council sends it back to the committee for further study.

1977 -- City Council adopts a policy of requiring rehabilitation and not demolition of unreinforced masonry buildings; also directs a two year study to identify the buildings to be included in the policy and to assess the impacts of forcing rehabilitation.

1979 -- City Council receives a report identifying 8,000 buildings and suggested ways to rehabilitate them. Council orders further study of the cost of rehabilitation.

1980 -- City Council told it will cost approximately $750 million to rehabilitate the 8,000 buildings.

1981 -- City Council adopts ordinance requiring the owners of the 8,000 buildings to rehabilitate them.

There was controversy at every stage. Not unexpectedly, the owners of the structures under consideration were frequently outspoken in their beliefs about the "unnecessary" burden being placed upon them. In a somewhat unusual alliance, the tenants and users of some of the targeted buildings joined forces with the property owners and also objected to the policy at virtually every stage. At a December, 1980 city council meeting, for instance, over 400 renters in the affected buildings voiced their disagreement with the ordinance that was eventually adopted. Other than city staff personnel, support for the policy came from professional associations of engineers and geologists, the Los Angeles Times and a few individuals.

Several observations can be made about the reasons for the eventual success of those who advocated the policy:

(1) The original impetus for the 1981 policy was the 1971 San Fernando earthquake. This event served as the catalyst in bringing the issue of older buildings to the forefront.

(2) Only the persistence of a few council members and city staff kept the older building issue from being defeated or slipping between the cracks of the policy-making process. Issues that drag on for many years without resolution frequently die as the original energy and attention dissipates. This issue was different because of the commitment of several key individuals.

(3) Throughout the seven years of discussion and controversy, a major newspaper, the Los Angeles Times, gave considerable news coverage to the issue of older buildings

and consistently editorialized in favor of city action whenever the matter came before the council. This attention and support contributed to the willingness of certain city staff and elected officials to persevere in the face of opposition from affected parties.

(4) All of those city personnel, elected and appointed, who were actively involved in this issue accepted the need for flexibility and compromise on the "details" of their plan. As on so many other issues, when competing interests and considerable financial stakes were involved, forging a winning coalition on the city council required compromise. Several examples will illustrate the kinds of compromises made during the seven years. For instance, the original estimate of the number of buildings that should be subject to the policy was 14,000. In order to reduce the conflict, and as a result of more exact criteria for inclusion of a building, the number was eventually reduced to 8,000. The original legislation envisioned the building rehabilitations being completed within a ten year time span, while the final version establishes a formula that results in a fifteen year time span for completion of all rehabilitations. As a result of a change in state law in 1979, the city was able to require less in the rehabilitated structures than what the current UBC established for seismic design criteria.[22] Therefore, instead of requiring that the old buildings be brought up to current code, the legislation

was changed to require approximately 60 percent of current code requirements.[23] A further compromise was the exclusion of residential structures of less than five units from the provisions of the ordinance.

While these changes in the original policy were finding their way into the final version, there was no compromising on the basic premise -- government should regulate the older buildings and require their rehabilitation. The politics of any regulatory issue such as the old buildings ordinance are usually characterized by a win-loss condition on the basic premise.[24] There are clear victors and losers over the basic issue of whether to regulate or not. What is negotiable and subject to some compromise are the conditions of the regulation.

Adoption of the ordinance in January, 1981 may have been the completion of an arduous task for the proponents, but, of course, the adoption does not guarantee successful implementation. No one was able to identify conclusively the source(s) of money for the rehabilitation effort. The city has no intention of providing financing. There is no indication of interest by the state or the federal government. Some banks may be willing to provide loans to property owners, but it is still too early to know the practicality of this financing approach. If there is an "Achilles heel" of the ordinance, it is the question of financing. With this in mind, a "special hardship" clause was written into the ordinance that allows extensions of time for compliance. This loophole may very well become important during implementation.[25]

Santa Rosa

Santa Rosa is a good example of how an earthquake can become the catalyst for significant public policy changes. The 1969 earthquake was a clear precursor to a serious effort at reducing the older building problem in the city. City Council Resolution 9820 was the centerpiece of the effort. Passed by a unanimous council on October 12, 1971, the Resolution establishes "criteria for the inspection of buildings within the City of Santa Rosa" by creating "policies and procedures...for the administration of the Uniform Building Code."

The major features of Resolution 9820 are as follows:

1. All buildings constructed before 1957 (except schools and 1-2 family dwellings) and all buildings built after 1957 using unreinforced masonry walls will be given a preliminary engineering review by city staff.

2. A priority list for the order of preliminary reviews is established. The list starts with public assembly buildings, hospitals, and government buildings and then moves to buildings adjacent to busy public sidewalks, buildings open to the general public, apartment buildings, low occupancy buildings, and, finally, a residual miscellaneous category.

3. After the preliminary review, the building inspector will issue a written opinion stating whether the structure complies with at least the requirements of the 1955 Uniform Building Code.

4. If the structure does not meet the 1955 requirements, then the property owner must arrange and pay for a thorough inspection and analysis by a structural engineer, who must then submit a report to the city detailing the work required to rehabilitate the building up to the requirements of the current building code.

5. Failure to comply with a city order to undertake a structural engineer's review or failure to implement the engineer's recommendations will cause the city to invoke the "hazardous building" section of the UBC and order the structure's demolition.

It was no coincidence that Resolution 9820 was adopted after the experience with an earthquake in 1969. The Resolution was a direct outgrowth of the city's response to the earthquake and it represents an attempt by several key individuals to capitalize on the earthquake. Not only was Santa Rosa able to accomplish some of its downtown revitalization plans by expanding the boundaries of an urban renewal project already underway, but the earthquake served as the occasion for the city to seek expert advice about the more general problem of older buildings throughout the city. Again, it was the urgings of a few city staff members (notably the planning director) and the concurrence of the city council which lead to the appointment of a blue ribbon advisory commission to recommend a course of action about older buildings.

The commission was composed of local residents who were prominent in structural engineering, construction, and real estate. An outside expert was retained as a consultant. To be sure, this type of membership was drawn from occupations that might stand to gain from any city effort to rehabilitate or remove older buildings. Yet it appears that the community reputation and status of the commission members overcame any suspicions on that count. The commission's work -- and the viability of its recommended Resolution 9820 -- was greatly enhanced by an earlier city council decision. Shortly after the earthquake the head of the city building department retired and a decision was made to replace him with a building official who had a structural engineering background. This in turn lead to the hiring of additional staff with a similar background. Therefore, implementing Resolution 9820 was possible with existing city staff, an argument used to support its adoption as it would not require the expenditure of additional revenues.

Another important factor accounting for the passage of Resolution 9820 was the political strategy used -- a blue ribbon commission. No only was the advisory commission composed of knowledgeable and respected individuals, but as the discussions of what to do about older buildings progressed it became clear that the commission could recommend a strong program requiring <u>all</u> older buildings to be brought up to <u>current</u> code requirements. This, of course, would have affected many more buildings than the Resolution as actually adopted. The Resolution had the appearance of a reasonable compromise in its use of the 1955 UBC as a "cut off" point. There were some protests by a few property owners, but the commission's strong support, combined with support from city staff and business groups such as the Chamber of Commerce, persuaded an already receptive city council. The commission-oriented strategy worked in this case, but it is important to remember that it operated in the presence of a supportive city staff, a city council already interested in seismic safety, and with a business community that had already decided to support downtown rehabilitation for seismic safety reasons as a part of the urban renewal effort.

Implementation of Resolution 9820 has proceeded with a minimum of public attention or notoriety. This has been the case for a few reasons. First, the city's approach has been to encourage rehabilitation if at all possible and demolition of structures only as an absolute last resort. Only five buildings have been removed under city orders, a small fraction of the several hundred structures reviewed under provisions of the resolution. Rehabilitation is less visible and less controversial than physical removal of a building and the long-term economic consequences are sometimes better when the demolition and the rebuilding costs are considered.

Second, the city council made it clear right after adoption of the Resolution that is was serious about implementation. As we have seen in this and earlier chapters, elected officials frequently send "signals" to the bureaucrats assigned implementation tasks. If the message is to tread lightly -- a message given in a refusal to fund staff positions necessary to implementation of a policy, for example -- then the bureaucracy will usually react accordingly. The opposite also holds true. In Santa Rosa, the city council not only said what it wanted by passage of the Resolution, but in a precedent setting case shortly after adoption the city council denied an appeal from a staff decision brought by a displeased property owner. The city council, in other words, said it was serious about the older building problem and that the city staff would be supported in its implementation activities.

To summarize, Resolution 9820 stated a clear objective and specified an implementation strategy. The council provided the resources (in the form of staff) and the political support necessary for earnest implementation. The agency charged with implementation had the necessary expertise and was headed by an individual personally committed to the objectives. No serious public opposition developed, and, in fact, the local business community and many well-known engineers, architects, realtors, and contractors supported the policy. This combination of circumstances was instigated by the events and consequences of the 1969 earthquake.

Burbank

An abortive attempt in Burbank to pass an ordinance which would have required the posting of a sign indicating buildings of dubious structural integrity and a recommendation to evacuate it in an earthquake offers a perspective on an approach to older buildings quite different from what we have just seen in Los Angeles and Santa Rosa. Most of the older commercial buildings and a few older hotels in Burbank are located in an area known as the Downtown Mall. The commercial buildings are used primarily by small retail establishments. It has been estimated that approximately 100 unreinforced masonry buildings (primarily commercial) exist in Burbank; the majority of these structures are in or adjacent to the Mall.

The 1977 election of Mr. Jim Richman to the city council marked the beginning of conflict over seismic safety policy within Burbank. Shortly after his election, Mr. Richman expressed his belief that most of the Mall structures were vulnerable to collapse in an earthquake. He suggested that the city take action to force either structural rehabilitation or demolition of these buildings. When this idea received no support, he then proposed an ordinance requiring a warning sign in each "questionable" building. The sign proposal received widespread publicity in the local media and it generated a strong reaction by the Mall property owners and their tenants. The proposed ordinance was on several agendas of both the city Board of Building and Fire Code Appeals and the city council. Opposition was very intense while support came only from the proposal's original sponsor and a few individuals (one of them a structural engineer). The idea was defeated on a 4-1 vote amidst numerous expressions -- by property owners and council members -- of disagreement with the need for and the fairness of the ordinance. The substantive objections were also frequently coupled with attacks on Councilman Richman.

While reactions to both the substance of the proposal as well as perceptions about Councilman Richman played a role in the political dynamics, a glance at only the substantive objections reveals some attitudes not uncommon in many communities. The fact that most Mall buildings withstood the 1971 San Fernando earthquake with little or no damage was frequently cited by property owners as evidence that their structures were able to survive future shaking. References to the performance of unreinforced masonry structures -- uniformly poor in moderate to strong ground shaking -- in several previous earthquakes around the world were not accepted as valid evidence by those who had seen their own buildings survive the 1971 earthquake. Thus, they argued, there simply was no need to question the viability of their structures by posting a warning sign.

Other property owners and businessmen argued that the proposed sign ordinance would drive away customers from an already declining downtown commercial center. The economic consequences would be unfair, it was asserted, because the city would be taking the action without providing any compensation for the predicted loss in business. Unfairness was also alleged by those who pointed out that Burbank's economy (particularly its retail sector) was part of a larger economy in the entire San Fernando Valley. To force property owners in Burbank to spend a considerable sum of money on their buildings while neighboring jurisdictions were not requiring similar action would put some Burbank property owners in an unfair competitive position.

Several city council members and some city staff voiced another kind of reaction to the Richman proposal. They agreed that some buildings were possibly unsound, but in their opinion the proper way for the city to respond was a combination of urban renewal and laissez-faire philosophy. Part of the downtown area under discussion was likely to become a designated urban renewal project and thus many buildings would be removed and the owners compensated as part of a master plan for upgrading the area. Although the urban renewal project was not yet formally approved by all the relevant governmental agencies, and the necessary contracts with private developers had not yet been signed, this approach to seismic safety was consistently employed as a rationale for why the city should not adopt the sign ordinance. The sections of the downtown area not subject to the possible urban renewal project should, in this viewpoint, be left alone by the city and in due time the "natural" process of attrition and private economic activity would alleviate the problem of older buildings. Absent the ability of government to compensate building owners such as in the urban renewal area, it was wrong for the city to do anything that might reduce the value of the properties; a sign ordinance presumably was thought to do so.

A combination of self-interest expressed in strong terms in the political arena, a philosophy about what government's role ought to be, and some negative reaction to the sponsor himself all combined to defeat the sign ordinance. Seismic safety briefly became a political issue in Burbank and the conflict over the fate of older buildings was resolved in favor of possible future action via urban renewal and possible future action by private individuals. But the city itself would not take an active or immediate role. Given the fate of the proposed sign ordinance, it does not take much imagination to realize the probable fate of any attempt -- as Richman originally proposed -- to require rehabilitation or demolition of the Mall properties.

Oakland

Oakland is a city with a commonly recognized potential for serious problems from older buildings, but it is also a city that is doing very little to reduce the risk it faces.

A moderate amount of ground shaking from movement on any one of the nearby active faults, including the Hayward or San Andreas, will probably induce significant damage and perhaps structural failure in some older buildings. While it is not a matter for everyday discourse among citizens of Oakland, the problem is one which is familiar to city officials and many building industry professionals (i.e., architects, contractors, realtors, engineers). The Oakland Seismic Safety Element discusses the situation with older buildings and the city adopted a recommendation contained in the Element to "consider" a program requiring rehabilitation or demolition of all potentially hazardous buildings, including public facilities. No serious consideration has been undertaken, except for a study commissioned to examine the potential earthquake performance of the City Hall building. The City Hall report highlights the dubious structural integrity of the building and raises questions about its ability to withstand an earthquake without serious damage. The report continues to gather dust in the building it evaluated.

Why has nothing been done about the potential problem from older buildings in Oakland? The overriding reason is quite clear: Oakland is widely perceived by elected and appointed officials and relevant private sector leaders and professionals as a city with many problems more immediate and serious than older buildings. Seismic safety matters, including older buildings, are not perceived as important relative to other problems such as crime, unemployment, educational quality, racial tensions, public finance issues, transportation, etc. These issues are seen as so important that they virtually eliminate other issues such as older buildings from the public agenda if there is not an immediately evident problem affecting Oakland citizens. Following directly from this view is the corollary belief that to do anything about older buildings will drain too much public and private sector money and attention from other needed activities. To force private property owners to rehabilitate their structures is widely seen as economically impractical, and, therefore, if attempted, would put many property owners in a position of either refusing to comply or simply abandoning their properties. The vision of extensive conflict over enforcement, or additional abandoned properties in a city where deserted buildings is already a problem, further diminishes any incentive to consider seriously action on older buildings. With respect to the public sector costs of an older building program, the city would be required to finance an extensive survey and perhaps examination of private and public buildings and then pay for enforcement costs. In a city where government's financial resources are already stretched very thin, and where the city has already curtailed the budget of its Building Inspection Department, it is unlikely that the additional costs of an older building program will be perceived as appropriate and necessary.

This definition of the situation in Oakland leads to different attitudes about the older buildings. The "ostrich" attitude is a common one -- ignore the problem and maybe it will go away or there will never be an earthquake. The crushing nature of Oakland's many troubles also leads to an attitude of concern but resignation by many public officials. Too many problems, too little money, and too few ideas for solving the problems means that seismic safety has to be ignored (unfortunately, some officials would say) until other more pressing needs are met. Perhaps in a search for a ray of sunshine in this cloudy picture, some city officials place their faith in the eventual solution of the older building problem by a process of attrition. Older buildings will eventually be replaced by economically more efficient structures; in the rebuilding or rehabilitation the modern UBC can be applied. Even those who share this perspective realize that there is a certain degree of wishful thinking involved. The cards are clearly stacked against any concerted effort to ameliorate the problem.

<u>Salinas</u>

At the time of our research, Salinas was a city trying to make up its collective mind about an approach to an older building problem in the heart of its downtown commercial area. Approximately 25-30 percent of the downtown buildings date back to the late 1800's, and most of the remainder were constructed before the building code required any attention to earthquake generated forces. The central downtown area is considered at serious risk of numerous building failures in the face of any significant ground shaking.[26] Complicating the decision about the downtown's future is a joint effort by the city and the downtown merchants and property owners to "revitalize" the area in the face of some physical deterioration and competition from other retail shopping centers.

In an effort to clarify the exact status of the older buildings in the downtown, the city contracted for an engineering evaluation of approximately 100 structures. While each property owner has been informed of the engineer's evaluation of his own building, results in the report have not been publicly revealed. Apparently most of the buildings examined were found in need of major rehabilitation if they were to withstand the ground shaking associated with earthquakes possible in the general area.

The report may have clarified the structural conditions of the downtown buildings, but it has also confused and complicated the decision-making process. The key participants in the downtown project have been unable to arrive at a consensus on future action and no clear majority opinion has emerged on the city council; the report has fueled the controversy. A quick look at the different viewpoints illustrates the difficulty of developing a winning coalition in a fractionized decision-making environment. City staff officials, especially those involved in building and development related duties, view the report as supporting a "strong" city position on strengthening the older buildings; there is also some opinion that most of the buildings in question should be razed. A prominent local developer argues that the private sector should be permitted and encouraged to "redevelop" the downtown without any city involvement except an indication that the city will provide the necessary permits. While it is hard to be precise about the attitudes of all property owners, it is apparent that most, or at least the most vocal, do not favor removing buildings and are unsure about the necessity and economic feasibility of rehabilitating them. At least one spokesman for some of the downtown merchants simply does not believe that the buildings are at risk. When asked what he thinks ought to be done, he responded, "Nothing. The buildings have survived so far and they will continue to do so."

The city council is without a clear direction or policy. The council members persist in looking for a consensus to emerge on what was called "a happy medium" between revitalization efforts at the least possible cost and the apparent need to increase the sturdiness of the buildings. That consensus has not been forthcoming from the relevant interest groups in the downtown community. The council has been unwilling to resolve the issue absent a consensus, or at least a visible majority position about what is appropriate. The expert advice points to a serious potential problem; most of the affected parties disagree. Among those who admit a problem, there is a disagreement on the solutions, and the city council continues to ponder. Thus, a stalemate -- and the older buildings stand for now.

Summary and Conclusions

State law requires local building codes that are reasonably consistent in their content, especially with respect to provisions relating to seismic safety. Actual enforcement, however, of the code's letter and spirit, is not a certainty. The discretion vested in building departments in their interpretation and application of the UBC guarantees some variation in implementation. Most private sector respondents viewed building departments as reasonable and fair. Building department activities are conducted in a low visibility arena because neither the building department in general nor seismic safety in particular are usually matters of note for the local political environment.

Building department officials do not usually perceive seismic safety as an important, high priority item for their department; this is notably the case in jurisdictions which have not recently experienced an earthquake. Application of the UBC seismic provisions to newly proposed buildings is not a matter of serious or general controversy. Its appropriateness seems to be accepted by the private sector as well as building department staffs. To the extent that a disagreement arises, it is over specific features of specific structures and not as an objection to general policy about earthquakes.

It is hard to escape the general conclusion that most building departments are not energetically implementing the UBC in the strictest sense. There is latitude given; such is probably inevitable in any type of code enforcement. Yet because of advances in UBC seismic requirements, the probability that a building constructed in recent years will withstand an earthquake has increased significantly over the probability of two or three decades ago. The critical tone of this chapter should not obscure this. Nevertheless, the next significant earthquake will test the wisdom now being exercised in the UBC's implementation.

Our brief look at the way in which five jurisdictions have responded to the presence of older and potentially hazardous buildings revealed some important variations. The cities of Los Angeles and Santa Rosa stand out for their efforts at problem resolution. It is simply too early to assess Los Angeles' program except to note its vulnerability to funding problems. Santa Rosa has persisted and achieved some considerable success with its Resolution 9820. The Resolution and its implementation became an integral part of local governmental activities during the 1970's. We have indicated the lack of action on older buildings by Burbank, Oakland, and Salinas, but they should not be considered atypical. Indeed, it is Los Angeles and Santa Rosa that are unique. The vast majority of communities in the state have not systematically identified their potentially hazardous older buildings, let alone taken any action. Indifference, resignation, ignorance, and fear of political retribution account for the lack of action on older buildings. Nothing on the horizon appears likely to change this.

APPENDIX 5A

Building Code Related Recommendations Adopted in the Seismic Safety Element And the Record of Their Implementation

Burbank:

1. Develop categories of relative hazard of structures.
   (Not done.)
2. Develop timetable for meeting standards emerging from recommendation #1.
   (Not done.)
3. Identify and request evaluation of hazardous structures not under city jurisdiction.
   (Not done.)

Glendale:

1. Modify city building code to take into account seismic zones identified in SSE.
   (Accomplished.)
2. Identify all structures which do not meet code standards.
   (Not done.)
3. Establish and implement program for "orderly elimination of hazardous buildings."
   (Not done.)
4. Create a review committee to consider criteria for unsafe building abatement.
   (Not done.)
5. Require review by structural engineer of all pre-1948 critical facilities.
   (Not done.)

Los Angeles

1. Review city owned buildings and upgrade or replace those that do not meet "seismic policy risk criteria."
   (Some review, very little upgrading or replacement.)
2. Request federal and/or state assistance to implement the corrective measures required for city owned buildings.
   (Not formally done; informal indications that neither state nor federal government interested.)

Los Angeles

3. Request county, state and federal governments to assess their structures within city.
   (Not formally done.)
4. Continue research on how to repair/modify damaged buildings.
   (On-going, at a very modest level.)
5. Develop a plan to strengthen or abate buildings that do not meet seismic safety policy risk levels.
   (Accomplished by ordinance.)
6. Limit seismically unsafe buildings to current or less hazardous occupancies.
   (Usually followed.)
7. Continue parapet abatement program.
   (Yes, but program almost complete before adoption of SSE.)
8. Continue to update building code with respect to consequences of ground shaking.
   (Accomplished.)
9. Seek legislation requiring county, state and federal buildings within city to meet city seismic safety criteria.
   (Effort made, but with only modest success.)

Los Angeles

1. Provide the County Engineer with necessary staff, funding and authority to:

   a. conduct an inventory and evaluation of potentially earthquake hazardous pre-1933 buildings.
   b. identify building occupancy type, value, ownership and age, social and economic characteristics of occupants.
   c. establish priorities for the renovation, demolition, or occupancy reduction of identified earthquake hazardous old buildings.

   (Not done, except for a "sidewalk survey" conducted in 1973 before the SSE. No funds provided to County Engineer to carry out this policy.)

Los Angeles County (cont.)

2. Direct the County Engineer, in cooperation with the Department of Urban Affairs, to initiate applications for federally assisted demolition funds.
   (No funds provided.)
3. Direct the County Engineer, in cooperation with the County Counsel, Regional Planning and Urban Affairs departments to investigate the feasibility of mandatory occupancy reductions for identified earthquake hazardous old buildings.
   (Not done.)
4. Adopt the necessary ordinances to require that all identified earthquake hazardous old buildings be publicly posted.
   (Not done.)
5. Direct the County Engineer to modify existing building regulations to require increased bracings and overall seismic resistance of non-structural components of medium- and high-rise buildings.
   (Accomplished.)
6. Amend building and zoning ordinances pertaining to medium- and high-rise development to provide for earthquake safety considerations including pedestrian safety, access for emergency vehicles, and evacuation assembly areas.
   (Accomplished.)
7. Direct the County Engineer to review current building code requirements for facilities housing dependent populations, and improve code requirements where needed.
   (Not done.)
8. Adopt building code modifications prohibiting the construction of facilities for dependent populations within one-quarter mile of active or potentially active fault zones.
   (Not done.)
9. Direct the County Engineer to identify and evaluate county owned hospitals, and police and fire facilities not meeting current seismic site design, and construction standards.
   (Not done.)

Los Angeles County (cont.)

10. Approve the allocation of funds to provide relocation services to persons and businesses voluntarily wishing to relocate from identified hazardous old buildings.
(Not done.)
11. Authorize the development and implementation of a phased program for the demolition of hazardous pre-1933 buildings where other risk reduction measures are not feasible.
(Not done.)
12. Authorize the funding and implementation of a phased program for the renovation or replacement of county owned vital facilities not meeting current seismic design and construction standards.
(Not done, except for the sale of some county buildings.)

San Fernando:

1. Require special seismic hazards investigations on critical structures located in areas of potential ground rupture and/or strong ground shaking.
(Accomplished, but rare for a critical facility to be built.)
2. Adopt the UBC and its revisions as issued.
(Accomplished.)
3. Adopt a program to require all critical structures to be "brought up to code or demolished."
(Not done.)

Simi Valley:

1. Adopt the latest UBC.
(Accomplished.)
2. Modify city building code (i.e., UBC) to account for data in SSE on seismic zone.
(Accomplished, but not where it would lead to more stringent code than UBC.)
3. Identify all structures which do not meet code.
(Not done.)
4. Establish and implement program for "orderly elimination of hazardous old buildings."
(Not done.)
5. Create a review committee to consider whether to start condemnation proceedings against unsafe structures.
(Committee never established.)

Simi Valley (cont.)

6. Emergency response facilities should be examined and potential problems corrected. (Not done.)
7. Critical facilities built before 1948 should be inspected. (Not done.)

Santa Rosa:

1. Continue to enforce Resolution 9820 and abate structural hazards. (Accomplished.)
2. Ensure that new construction meets the latest standards (i.e., latest UBC). (Accomplished.)

Alameda County:

1. Identify unsafe structures with high density and/or public use. (Not done.)
2. Determine corrective measures for identified unsafe structures. (Not done.)

Berkeley:

1. Identify hazardous structures and evaluate ways to correct hazards. (Partially accomplished: survey of downtown identified some hazards and about twenty buildings corrected parapet problem. Nothing else done.)
2. "Establish a program to have critical, essential and high occupancy structures highly susceptible to damage either reinforced, relocated or demolished." (Not done, except for some work mentioned above.)
3. Update codes for new structures. (Accomplished.)

Fremont:

1. Adopt latest version of UBC. (Accomplished.)
2. Give building official power to require seismic analysis and geologic report for buildings. If unsafe, empower him to declare it such and subject to abatement. (Building official has this power, but has not used it.)
3. Initiate program for hazardous building appendages. (Not done.)

Fremont (cont.)

4. Conduct structural and access evaluation of all public buildings, high occupancy buildings and all pre-1940 buildings.
   (Not done.)
5. Specify design and installation standards for emergency service buildings.
   (Not done.)

Hayward:

1. Inspect buildings suspected of being structurally unsafe. Hire building inspector for this purpose.
   (Not done.)
2. All buildings found to be structurally unsafe should be declared public nuisances and abated as per UBC.
   (Not done.)
3. Amortize hazardous buildings as soon as possible.
   (Not done.)
4. Set priorities for hazardous buildings based on risk they pose.
   (Not done.)

Oakland:

1. Consider a program to require reinforcement or demolition of structures which are highly susceptible to damage in earthquake.

   a. inspect all hazardous buildings.
   b. evaluate all public buildings.

   (Not done, except for evaluation of City Hall.)
2. Employ the most current seismic design criteria in construction of new buildings.
   (Accomplished.)

Salinas:

1. No specific recommendations; mentions that a survey of downtown buildings has shown that about 60 percent of them are structural hazards.

CHAPTER 5

Footnotes

[1] "Earthquake Hazards Reduction: Issues for an Implementation Plan," Working Group on Earthquake Hazards Reduction, Office of Science and Technology, Executive Office of the President, 1978, p. 37.

[2] Ibid.

[3] American Institute of Architects Research Corporation, Architects and Earthquakes, Washington, D.C., 1975, p. 71.

[4] Advisory Commission on Intergovernmental Relations, Building Codes: A Program for Intergovernmental Reform. Washington, D.C., 1966.

[5] State of California, Health and Safety Code, Section 19150.

[6] Ibid., Section 19101.

[7] Ibid., Section 19120.

[8] Titles 24 and 25 of the State Administrative Code explains the membership of the Commission, its powers, and the responsibilities of local governments with respect to building codes and earthquakes.

[9] John Blume, comment in Newsletter of the Earthquake Engineering Research Institute, Vol. 13, No. 6, November, 1979, p. 2.

[10] The Salinas SSE contains a reference to a report prepared for the city on the structural integrity of buildings in the downtown.

[11] Salinas again is an exception because the report on old buildings was prepared prior to the SSE. Salinas has done nothing to implement the report's findings. San Fernando's SSE only talks about studying and abating problems with "critical facilities" meaning by that term fire and police stations, hospitals, and other such structures vital to any emergency services response to an actual earthquake.

[12] U.S. Department of Justice. Law Enforcement Assistance Administration, "Corruption in Land Use and Building Regulation," Washington, D.C., 1979, p. 24.

[13] Ibid.

[14] Ibid. This report details the opportunities -- or incentive system -- for corruption in building code enforcement. It also contains many case studies of actual corruption.

[15] While the same comment could probably apply to on-site inspections of structures under construction, we have so little data about inspection practices that this section must be confined to plan review activities.

[16] For some reasons why this attitude may be inappropriate, see William B. Eddy, Public Organization and Development, Cambridge: Winthrop Publishers, 1981, especially pp. 65-68.

[17] An obvious exception is the case where older buildings are targeted for rehabilitation or demolition. This will be discussed in the next section of the chapter.

[18] Admittedly, we were not privy to private conversations between building department staff and those in the construction industry.

[19] For further evidence and discussion on this point, see International Conference of Building Officials, "Issues Which Affect the Role of Building Departments in Earthquake Hazard Mitigation," Whittier, CA., April 1980 and California Seismic Safety Commission, Hazardous Buildings. Sacramento, March, 1979.

[20] Los Angeles Times, p. 4, Part II, July 8, 1980.

[21] Some of the information for the chronology came from Kenneth A. Soloman and David Okrent, "Seismic Building Codes for Los Angeles, California -- A Brief Case Study," Santa Monica, CA: The Rand Paper Series, November, 1977.

[22] State of California, Health and Safety Code, Article 4, Sections 19160 - 19169.

[23] Los Angeles Time, p. 1, Part II, January 8, 1981.

[24] For a good discussion of the relationship between different policy typologies and seismic safety policy, see

Richard S. Olson and Douglas C. Nilson, "Public Policy Analysis and Hazards Research: Natural Complements," Social Science Journal, 19 (January, 1982), pp. 89 - 104.

[25] The city itself is having trouble finding the money to correct structural deficiencies in city-owned buildings. Seventeen fire stations, fourteen public libraries, and forty-seven other city-owned buildings require rehabilitation or demolition according to the standards adopted in the 1981 old building ordinance. The city has been forced to "ask" itself for time extensions under terms of the ordinance. See Los Angeles Times, December 12, 1982, p. 1, Part VIII.

[26] This opinion was expressed by several city staff members and is based on a report prepared by a consulting engineer. The report is not universally accepted as providing a basis for action. One city council member discounted reports by experts that indicate some buildings should be demolished. This council member was asked, "What would it take to convince you that a building is so unsafe during an earthquake that it should now be removed?" The council member, the owner of a retail store not in the downtown area, replied, "If I can go look at it and see obvious weaknesses in the walls."

CHAPTER SIX

Emergency Response Planning and Seismic Safety

In a 1980 report, the Federal Emergency Management Agency (FEMA) considered the preparations for and consequences of a catastrophic California earthquake and concluded its executive summary with the following dramatic statement:

> While current response plans and preparedness measures may be adequate for moderate earthquakes, Federal, state, and local officials agree that preparations are woefully inadequate to cope with the damage and casualties from a catastrophic earthquake, and with the disruptions in communications, social fabric, and governmental structure that may follow. Because of the large concentration of population and industry, the impacts of such an earthquake would surpass those of any natural disaster thus far experienced by the Nation. Indeed, the United States has not suffered any disaster of this magnitude on its own territory since the Civil War.[1]

While the FEMA report does not express such alarm in the event of a moderate (i.e., 5.5 - 6.0 Richter magnitude) earthquake, the report's conclusion points to very inadequate emergency response planning for the consequences of the major (i.e., 6.5 - 8.3 Richter magnitude) temblors that can occur on several fault systems in California.

Based upon past experience and reasonable projections, an enormous array of problems will present themselves within minutes after the shaking stops. While the exact form may not always be known, the general kinds of problems can be clearly articulated prior to an event. A catastrophic earthquake will produce extraordinary law enforcement and fire suppression requirements; medical facilities and personnel will be overloaded; some sources of communication, water, power, and transportation will be out of service and thus the remaining facilities will be overloaded; heavy equipment rescue needs will be great; and communication and coordination within and between governments will be very difficult.

The theme of concern voiced in the FEMA report about the status of emergency response planning (ERP) has been echoed by numerous sources. This chapter documents some reasons for that concern and points out a few important exceptions. After a brief discussion of what ERP means, further observations about the status of ERP in California will be presented. This is followed by an analysis of what the Seismic Safety Elements (SSE) contain in regard to ERP and a more detailed examination of the status of ERP in some of the 13 research jurisdictions.

Definitions

Emergency Response Planning (ERP) is a form of mitigation, as is land use planning and building code implementation. However, ERP does not enjoy as common an understanding as the other mitigation forms and some attention to definition is in order. The term has had various uses in previous research and among practitioners; a brief look at three such uses and our own preference will clarify subsequent discussions.

In a report to his fellow commissioners on the California Seismic Safety Commission, Will H. Perry writes that "Disaster preparedness is any program to improve the capability of the community to respond effectively."[2] Even if the term "emergency response" were substituted for Perry's term "disaster", his definition is so broad that it would include virtually anything done in the name of seismic safety. Similar generality occurs in the above referenced report from FEMA:

> An emergency...is defined as an unexpected, sudden or out-of-the-ordinary event or series of events adversely affecting lives and property which, because of its magnitude, cannot be handled by normal governmental processes. Emergency response planning is the process that addresses preparedness for and response to an emergency.[3]

A more elaborate and more precise approach to definition appears in the work of Russell Dynes.[4] Dynes focuses on emergency planning as composed of four interrelated phases:

1. Mitigation :	"any activity which would eliminate or reduce the probability of occurrence of an emergency event."
2. Preparedness:	"planning activities which would minimize disaster damage and which would make emergency response more effective and efficient."
3. Emergency Response:	"providing assistance for types of disaster casualties."
4. Recovery:	"activities which continue beyond the emergency phase and move toward reestablishment of the community system."

When we speak of ERP in this chapter, we refer to the types of activities Dynes calls "preparedness". Notice that these are planning activities that occur prior to an actual event and they have goals of efficiency and effectiveness.

California Law and Emergency Response Planning

California law gives local governments the option of creating "Local Disaster Councils". Most choose to do so, including those jurisdictions in this research. If such a Council is created it must develop emergency response plans. As the law states:

> A disaster council shall develop plans for meeting any condition constituting a local emergency, state of emergency, or state of war emergency; such plans shall provide for the effective mobilization of all the resources of the political subdivision, both public and private.[5]

State law does not specify what should be included in an emergency response plan nor does it require that earthquakes be give attention in any plan. The law contains permissive language, giving local governments the option of establishing the organization, procedures, and tasks of the local disaster councils in any way they see fit.

The State Office of Emergency Services provides ERP assistance to local governments. OES has its own planning section that develops plans for earthquake response by appropriate state agencies. This section also works with local governments during the latter's preparation of plans and in conducting occasional earthquake simulation exercises. When federal money for ERP by local governments is available, it is funneled through the state OES.

In short, California law encourages but does not require ERP by local governments and the state has created an agency with responsibility to help local governments plan for the type of responses likely to be necessary after an earthquake hits. The Seismic Safety Commission apparently feels that ERP needs more attention because it has adopted as one of its goals "the incorporation of an earthquake preparedness and response program into the duties of all levels of government, and the maintenance of adequate levels of emergency response capability".[6]

Previous Assessments of ERP in California

Recent commentators on the status of ERP in California have emphasized its less than adequate condition and have offered several explanations for this status. The following discussion will sound negative and critical, but the variety of sources cited gives credence to the assessments. Our own research (presented in subsequent sections) generally confirms what these observers report, with some notable exceptions.

After summarizing the overall condition of ERP, California Seismic Safety Commissioner Will H. Perry pinpointed the problem areas:[7]

1. Lack of executive leadership for disaster preparedness.
2. Lack of local disaster programs.
3. Lack of emergency operating centers in many communities and inadequately equipped centers in others.
4. Lack of training for local officials.
5. Lack of disaster program guidance and assistance from the State Office of Emergency Services.
6. Inadequate mutual-aid plans.
7. Lack of or inadequate dam failure evacuation plans.

This damning array of problems makes the essential argument that ERP is at a rudimentary stage.

The ability to communicate after an earthquake strikes is obviously important for those agencies and individuals charged with responding to the aftermath. Communication is a key ingredient in efforts to save lives, restore critical services, and remove dangerous debris. According to William W. Ward, Jr., however, most of the state's communication systems "are 30 years old and wholly inadequate for a great catastrophe".[8] Ward, a regional director for the Office of Emergency Services, makes the point that in many parts of the state virtually nothing has been done to update communication equipment and plan for coping with the inevitable communication problems.

When FEMA (in cooperation with the Office of Emergency Services) conducted their 1980 review of ERP in California, they analyzed the plans and preparedness of 60 local governments, 34 state agencies, and 17 federal agencies with California operating responsibility. The report presents several reasons in support of its conclusion that a response to a catastrophic earthquake would become "disorganized and largely ineffective".[9] According to FEMA, there is no coordination in planning between governments at the same or at different levels, long-term recovery is not considered in current planning, significant communication problems are ignored, and the possibility that an earthquake may be scientifically predicted before it occurs is not incorporated into ERP. FEMA argues that strong leadership by key individuals at all levels of government is an important first step, followed by a recognition that ERP must be "developed as a partnership" between all relevant governmental units because "none have (sic) the resources or authority to solve the problem alone.[10]

In 1979 the California Seismic Safety Commission conducted a survey of local officials' opinions about ERP in their respective jurisdictions. A similar questionnaire was administered to state officials and state legislators.[11] No local official thought their preparedness was "poor", but 59% of city officials and 43% of county officials rated their preparedness as only "fair", with the remaining respondents choosing the "good" category. Despite this modest evaluation of their preparedness, local officials showed more confidence in their jurisdictions' preparation for earthquake response than did state legislators. Furthermore, state agency personnel as well as state legislators were pessimistic about the state government's preparedness for response to a catastrophic earthquake. Reflecting upon these data from the Commission's survey, as well as similar data not reported here Olson and Scott argue that "state and local leaders need to make much greater commitments to earthquake preparedness".[12]

In a background report prepared for the Southern California Earthquake Preparedness Project, Douglas Nilson et al., rely upon data gathered on local government ERP by the state Office of Emergency Services. They report that

> While 93% of the jurisdictions studied [by OES] have basic emergency response plans, these plans tend to be limited to the establishment of chains of command and to functional responsibilities for response to the hazards a particular community faces...Only 35% of the jurisdictions have developed the 'earthquake contingency' support annex required to make the basic plan operational To summarize, a staggering 65% of California local jurisdictions face a threat for which they have only a vague and general plan.[13]

The Nilson commentary furnishes a strong reminder that writing a general plan for disaster response which most local governments have done, is only a first step in ERP. Not many jurisdictions have gone beyond that to confront specifically the nuances of the earthquake threat.

Local public services in California are provided by a fragmented multiplicity of autonomous and simi-autonomous governments. This proliferation of both general purpose local governments (i.e., cities) and more specialized governmental units (e.g., water districts, sewer districts, fire protection districts, etc.) makes a coordinated approach to ERP very difficult and usually tenuous. Within a single county there can be dozens or even scores of governments and no legal or political mandate that ERP be a coordinated effort. San Bernardino County is not atypical with its 17 separate cities and 70 independent special districts and 112 special districts governed by elected city councils or the County Board of Supervisors. The comments of San Bernardino County Administrative Officer Robert Rigney to a Congressional subcommittee illustrates the difficulty of coordination efforts and confirms observations presented in the FEMA report:

> Critical services needed in times of disaster such as waste, sanitation, fire protection, hospitals, are in the hands of approximately 160 special districts, none of which have enforcement powers for building and safety standards, or have very limited enforcement powers. In addition, it should be recognized that with a few exceptions, their facilities are not required to be built to the standards that we require for private structures...Some of these districts are single-purpose such as fire districts or water districts, and they do not need to coordinate their services or priorities for the expenditure of monies.[14]

Because earthquakes pay no heed to political boundaries, area-wide ERP stands out as a common sense approach. Being without incentives or mandates, however, it apparently does not typically occur. Linda Cohen and associates make the point that jurisdictional coordination of ERP is more of a problem in the Los Angeles area than providing the actual resources necessary for response:

> Los Angeles is not likely to suffer a resource crunch [in responding to an earthquake], but the complexity of organizing an effective response is greatly magnified by jurisdictional considerations. The ability to use resources effectively, not their aggregate availability, is the major problem in Los Angeles...interjurisdictional rivalry and jealousy can jeopardize relief efforts, even leading to a chaotic response.[15]

With problems such as an absence of strong executive leadership, inadequate or absent coordination of ERP in urban areas, lack of efforts to improve communications, vagueness in response plans, and need for on-going training programs, it is not surprising that public officials and academic observers perceive the likely response to a major earthquake as less than effective and efficient.

Emergency Response Planning in the Seismic Safety Elements

ERP is usually given only cursory treatment in the Seismic Safety Elements. A few SSE's do not even mention it. Part of the reason for the scant attention may be attributable to the way in which the law and the Council on Intergovernmental Relations guidelines are drafted. The law requiring the preparation of an SSE contains no reference to ERP. This code section only refers to an Element that identifies and appraises geologic hazards and the earth movements that occur in an earthquake.[16] Despite the absence of ERP in the enabling legislation, the guidelines for SSE preparation and organization written by the Council on Intergovernmental Relations recommend inclusion of ERP in the Element. In a list of five topics that define the "Scope and Nature of the Seismic Safety Element," the guidelines list "evaluation of disaster planning program" as one point.[17] The second reference to ERP comes in the section of the guidelines that lists "Implementation Plans" to be included in the SSE:

> Inclusion of potential earthquake destruction in contingency plans for major disaster and emergencies. Review and liaison with Emergency Preparedness Organization and Police Departments of overall plans and major public facilities proposals as to their adequacy in emergency situations.[18]

The guidelines are clearly advisory and do not carry the force of the law. Yet they serve as benchmarks for evaluating the Elements because the guidelines articulate many points that are implicit in the law.[19] Furthermore, the SSE was intended to be the focal point of local government seismic safety planning and the inclusion of ERP surely deserves a place in that effort. There can be no denying the fact, however, that without a specific mention of ERP in the law itself the Council guideline reference to it lacks a certain amount of authority.

Table 6-1 presents our assessment of whether the SSE´s contain an evaluation of disaster planning as suggested by the Council of guidelines. A positive assessment in Table 6-1 stems from our operationalization of the term "evaluation" found in the guidelines. To meet the guidelines in at least a minimal fashion, the SSE must include some recommendations for ERP that are either explicitly based on an evaluation of ERP in the jurisdiction or recommendations that imply such an evaluation was conducted even though not discussed in the SSE. This is a very "easy" criterion and in no way does a positive assessment in Table 6-1 suggest a thorough evaluation with a full-blown set of recommendations. Indeed, as a few entries in Table 6-1 indicate, we were able to judge a few jurisdiction´s SSE´s positively only by the barest of margins, despite our criterion. Only three SSE´s -- Los Angeles City, Los Angeles County, and Fremont -- devote any appreciable amount of space in the Element to ERP. The remaining "positive" jurisdictions meet the minimal criterion, but are just that -- minimal in their evaluation of ERP. Keeping in mind all of these qualifications and considerations, Table 6-1 still permits the observation that those jurisdictions with recent earthquake experience are more likely to have an SSE that evaluates ERP than those jurisdictions without recent earthquake experience.

TABLE 6-1

Seismic Safety Elements that Contain
Evaluation of Disaster Planning Program*

Jurisdictions With Earthquake Experience		Jurisdictions Without Earthquake Experience	
Burbank	No	Alameda County	No
Glendale	Yes	Berkeley	No**
City of L.A.	Yes	Fremont	Yes
County of L.A.	Yes	Hayward	Nothing on ERP
San Fernando	Nothing on ERP		
Santa Rosa	Yes (barely)	Oakland	No
Simi Valley	Yes (barely)	Salinas	Yes (barely)

*The term "Disaster Planning Program" is used here because it is found in the Council on Intergovernmental Relations Guidelines. For our purposes, it can be used synonomously with "Emergency Response Planning "

**The Berkeley Element does contain an evaluation of a very outdated ERP (i e., 1961) and points out that the city is in the process of updating it; the Element also makes a few recommendation for ERP in the city

As in previous discussions of land use planning and building codes, we have tried to assess whether the jurisdictions that have adopted recommendations actually moved to implement them. In the instance of ERP, implementation was considered as any "serious" effort to carry out the adopted recommendations. Our judgment on this point was arrived at from a composite of personal observations and interviews with local public officials and relevant private sector individuals (e g., Red Cross officials). Table 6-2 shows our judgment of which jurisdictions have implemented the ERP recommendations.

The most glaring observation from Table 6-2 is the stark difference between experienced and non-experienced earthquake jurisdictions. In our judgment, the jurisdictions without earthquake experience have either not implemented their SSE recommendations on ERP or they did not make an evaluation of ERP in the SSE. It must be remembered however, that the SSE is not the only document to discuss ERP. Most jurisdictions, including those without earthquake experience have Energy Operation Plans that at least touch on earthquakes. Thus a failure to include recommendations or to implement recommendations from the SSE does not necessarily mean that a jurisdiction is doing absolutely nothing about ERP. For instance with the exception of San Fernando, Alameda County, and Hayward all the SSE's at least mention the jurisdiction's Emergency Operation Plan and say

TABLE 6-2

Jurisdictions That Have Implemented
Emergency Response Planning Recommendations
From Their Seismic Safety Elements*

Jurisdictions With Earthquake Experience		Jurisdictions Without Earthquake Experience	
Burbank	N.A	Alameda County	N.A.
Glendale	No**	Berkeley	N.A.
City of L.A.	Yes	Fremont	No
County of L.A.	Yes	Hayward	N.A.
San Fernando	N.A.	Oakland	N.A.
Santa Rosa	Yes	Salinas	No
Simi Valley	Yes		

*A "yes" or "no" assessment for this table was made only for those jurisdiction indicated in Table 6-1 as having an evaluation of ERP in their Elements; other jurisdictions are indicated here with a "N.A." -- not applicable

**Glendale must be categorized as a "no" with the minor exception that city department heads do occasionally meet to discuss ERP items.

it should include concerns about earthquakes. Nevertheless, as the subsequent section will indicate, ERP in the non-experienced jurisdictions seems less developed even when documents and actions other than the SSE are taken into account.

Emergency Response Planning Activities

The Seismic Safety Element is not the only document or focal point for local government ERP. Many jurisdictions have chosen not to utilize the Element for any ERP purpose and those that have may also possess other planning documents devoted to ERP. This section takes an overall look at ERP activities in the research jurisdictions. We will highlight ERP in several of the jurisdictions in order to demonstrate the general role of ERP in local government and to examine what learning experiences occurred subsequent to earthquakes. In the process of doing that, we also single out a few jurisdictions so that the "yes" and "no" in Tables 6-1 and 6-2 have more meaning

An understanding of local government ERP requires a recognition that it is simply not an important, high priority item. Probably the best indicators of the emphasis given ERP are the number of staff assigned to it their organizational location and the amount of time this staff devotes to ERP. Not surprisingly, only the larger jurisdictions of Los Angeles City, Los Angeles County, Alameda

County, and Oakland have any staff who work full-time on ERP. Most ERP in the City of Los Angeles is done by police officers and department personnel who have been delegated the task by the mayor. Los Angeles County has a small unit (five persons) within the County Administrator's Office to coordinate disaster services; additionally the Sheriff formed a small Bureau of Emergency Planning after the 1971 San Fernando earthquake. Alameda County has a Director of Emergency Services who in addition to ERP for the County does some planning on a contract basis for several cities within the county. Oakland has one police officer who devotes his time to ERP.

The other nine jurisdictions have assigned ERP responsibilities to staff who already have other major tasks. For instance, Berkeley and Santa Rosa's Fire Chiefs and a Burbank Battalion Fire Chief are also designated as being in charge of ERP. Fremont's Police Department Business Manager, Hayward's Assistant City Manager and San Fernando's City Engineer also double as head of ERP within their jurisdictions In all these cases, ERP responsibilities occupied a minority of their time -- usually a very distinct minority such as 5-10%. In other words, if the importance attached to ERP is measured by the amount of staff resources devoted to it, then clearly ERP is not seen as very important or pressing. It is not an activity that is totally ignored, but then again it is not allocated much staff time or energy.[20]

<u>City of Los Angeles</u>

The city's SSE lists ten specific programs of emergency preparedness. Progress has been made on all the programs listed; in some cases it has been quite substantial. By the accounts of those involved in ERP and our observations, the 1971 San Fernando earthquake experience provided a stimulus for ERP that was codified in the SSE. Subsequently active implementation began. As we have observed before in the previous chapters on land use and building codes, the commitment of a few key individuals to seismic safety goals -- in this case ERP -- is the primary explanation of why the city of Los Angeles has accomplished so much in ERP. With clear support from the mayor's office and a few city council members, it became possible for interested subordinates in several departments to commit the resources of time, energy, and sometimes money to ERP tasks.

The threatened collapse of the Van Norman dam immediately after the San Fernando earthquake was an event that had long-term impact on several city agencies, especially the Police Department. Evacuation of approximately 80,000 people living below the dam became the responsibility of the LAPD. The evacuation proceeded with relative smoothness, although the dam was not breached. Dam inundation maps are now available in the Police Department and supervisory personnel routinely receive training on evacuation procedures and problems.

Another example of a city agency whose current ERP benefits from experience with the 1971 earthquake is the Fire Department. Fire Department procedures now call for all fire fighting equipment to be moved out of fire stations at the first indication of an earthquake. With hindsight this seems like a simple idea, but in 1971 some equipment was rendered inoperable because of fire station building failures.[21] Fire Department ERP now assumes that there will be a a decentralized initial response after an earthquake. In other words, they now plan for the possibility (maybe certainty) that centralized communications and command will be disrupted. Personnel in the field receive training based on an altered and more decentralized authority and communication structure emerging right after an earthquake. The Fire Department has also greatly increased its organizational knowledge about underground utilities and pipelines, facilities likely to be a fire hazard as a result of earth movements. Again learning from the 1971 experience when several freeways became impassable because of collapsed bridges and overpasses, the Fire Department ERP now calls for fire equipment to use only surface streets in responding to problems after an earthquake. The City Fire Department now has arrangements to exchange communication equipment with the County Fire Department immediately after an earthquake so that these two large agencies can coordinate their responses.

Insuring an adequate flow of water after an earthquake can become a very important priority for fire suppression efforts; providing potable water for human consumption becomes equally imperative. Learning from some problems that occured in 1971, the Los Angeles Department of Water and Power (DWP) has modified and improved some of its ERP. For some time after the 1971 earthquake, it was necessary to use clean tank trucks to serve potable water to citizens in part of DWP's service area. Advance preparations for locating and using such trucks had not taken place. DWP has now made plans for this problem and should be able to provide potable water quickly to residents whose normal service has been disrupted. The agency has also worked out new plans with the Fire Department that will allow them more flexibility in moving water around disrupted facilities so that fire suppression will not be hampered. The stockpiling of crucial spare parts and improving communication equipment and procedures are also actions that show a heightened awareness of ERP by agency personnel.[22]

The city's Emergency Operations Center (EOC) has been upgraded and new procedures developed for its staffing and operation. Every city department has an earthquake response plan. These plans call for representatives of the major departments to report to the EOC so that the response can involve all of the relevant agencies. Several simulation exercises have been conducted so that agency personnel can acquaint themselves with each other and with the need for interaction in response.

As another example of city efforts to improve its ERP and implement a recommendation adopted by the city council in the SSE, the city formed an inter-agency task force on the impacts of an earthquake prediction on the city government. The task force report is a general survey of the scientific status of earthquake prediction and a discussion about what might occur subsequent to a credible prediction.[23] Following completion of the task force report which should be viewed as a beginning effort in planning a response to an earthquake prediction, the city council directed each city agency to include in its earthquake response plan some consideration of how the agency will handle the consequences of a credible prediction. The city sponsored a week long (September 29-October 5, 1980) series of lectures simulation exercises, public demonstrations and distributions of literature as a way of increasing public awareness of earthquakes and their impacts. City personnel received simulated response experience. The Los Angeles area mass media covered many of the activities and events.

This discussion about the city of Los Angeles is not intended to create an impression that the city has done all that is possible in the way of ERP. That is clearly not the case. Yet the city has undertaken an impressive array of activities, including some which are not reported above, in recognition of the fundamental premise of ERP -- trying to reduce damage and improve earthquake response efficiency and effectiveness. Crucial to any progress made by Los Angeles has been the support of several important elected officials and a willingness by key department heads to make ERP an accepted part of their responsibilities. There has been, of course, opposition and foot-dragging by some, and more sophisticated ERP is necessary, but by all accounts the city government is far better prepared to respond to an earthquake now than before 1971.

County of Los Angeles

Considerable review of the county's ERP occurred in the wake of the 1971 earthquake. In addition to a special task force created by the Board of Supervisors to evaluate the county government's response to that event, the Sheriff and the County Administrative Officer extensively reviewed their ERP. Several changes emerged from all this activity, some of which are reflected in SSE recommendations eventually adopted by the Supervisors.

Two of the most visible changes within the Sheriff's Department were the formation of a Bureau of Emergency Planning and the construction of a new Emergency Operation Center. This county EOC has a direct radio link with its counterpart in the city of Los Angeles. Sheriff's officers assigned to the Bureau of Emergency Planning are responsible for not only ERP by the Sheriff, but because of the Sheriff's designation as Director of Disaster Planning they also attempt to coordinate ERP by other county agencies such as Flood Control, Fire and Health Services. As the Sheriff's Department must necessarily decentralize its normal operations in order to provide service to such a large expanse as Los Angeles County, ERP has assumed that each Sheriff's substation will become a mini-emergency operations center after an earthquake. Each substation commander and immediate subordinates periodically receive a four hour disaster response training session conducted by Bureau personnel. A significant share of these training sessions are devoted to earthquake induced problems.

The Coordinator of Disaster Services, organizationally located in the County Administrator's office, is responsible for constructing an emergency response plan, promoting the training of disaster services personnel, and conducting an annual emergency exercise (frequently a simulated earthquake) for the entire county government. This office has been very active since 1971, despite some staff reduction

The Coordinator arranges for periodic meetings between operating personnel in the many county agencies with earthquake response assignments. These meetings involve top ranking agency executives as well as those with actual line responsibilities. Organizing protocals for post-earthquake communication between agencies, and procuring some new communication equipment, has also been undertaken by the Coordinator.

Despite the stepped-up ERP, it is impossible to conclude that the county has a fully integrated ERP process. Any governmental jurisdiction the size of Los Angeles County is going to have problems in trying to ensure that its various constituent parts are working together efficiently after an earthquake. There are gaps and inadequacies in county ERP. An example is communications in the field between one county agency and another and field communications between county agencies and their counterparts in adjacent cities. Similarly, some questions still exist about the county's awareness of ERP by private utilities and the procedures for coordinating county response with the utilities. Yet learning from 1971 has occurred and ERP now is more complete and probably more realistic. Furthermore, ERP in the county government is an on-going activity that has avoided stagnation.

Berkeley, Fremont and Oakland

Berkeley, Fremont and Oakland are examples of jurisdictions which can be characterized as having made some serious efforts at ERP, but where notable shortcomings still exist. Berkeley has a typical emergency operation plan that concentrates on defining the organizational relationships and functional responsibilities of various city officials and agencies. For instance, a Disaster Council is designated as a policy advisory body to the city council. Members include the City Manager key department heads, and private persons appointed by the City Manager. Not only have these private sector members not been appointed, but the Disaster Council as a body has never met. The city participates in disaster simulations as a training opportunity, but no evaluation of performance in the simulation has been conducted. The Fire Chief has been appointed as head of emergency planning and was working on an update of a 1961 emergency response plan. However, he has not been given any additional budget to carry out the work. While police and fire agencies in the East Bay area have reasonably strong working relationships and have given some thought to post-earthquake demands on their agencies, some Berkeley officials expressed concern about the absence of ERP coordination with a major utility in the area -- East Bay Municipal Utility District -- and with other entities such as the Red Cross and the Bay Area Rapid Transit District.

Fremont has written a detailed emergency operation plan and has given the response problems from an earthquake some attention. The city has acquired dam inundation maps that show the predicted flooding from a dam failure and the city has maps of underground utilities and pipelines. The city also has established a direct radio link with Pacific Gas and Electric; the radio network is tested weekly. Despite the obvious attention and concern about ERP, some potentially important problems exist. The designated EOC is located in the basement of City Hall. This structure may be vulnerable because of its very close proximity to the Hayward fault and because some of the dam inundation maps show likely flooding in the City Hall basement. Every city employee is assigned a task in the earthquake response portion of the emergency operation plan, but some city officials doubt that many employees are even aware of this assignment, let alone having any training or experience in carrying out the plan.

Oakland also has an emergency operation plan and it includes an earthquake response section. The plan identifies lines of authority and communication as well as indicating the general tasks that should be performed. The city occasionally participates in a simulation exercise. As Assistant Director of Emergency Services (the City Manager is Director) the Police Chief has responsibility for ERP in Oakland. For part of the 1970's the Police Department had a lieutenant and two or three patrolemen working on ERP, but after passage of Proposition 13 the task was downgraded and assigned to a single patrolman. Oakland's EOC is located in an amphitheater in the hills above Oakland. It is an area known for its unstable slopes and minor faults; an earthquake could render the Center inoperable. Communication equipment at the Center seems inadequate to the potential demands that would be placed on it after an earthquake. Some city officials have raised questions about the adequacy of emergency response training for city staff and about the ability of the city to coordinate its response with the county government and nearby cities.

These three jurisdictions share a common characteristic when it comes to ERP. They all know that ERP is necessary and they have done something about it, but ERP is clearly not a very important priority. No top level official, appointed or elected has pressed on ERP and made it an important activity. Only the barest amount of money and staff time has been allocated. In short, the rudiments of ERP are there but not much past that.

Salinas and San Fernando

The communities of Salinas and San Fernando have accomplished very little when it comes to ERP. Salinas has an emergency response plan, but it is very basic with little detail. There is no indication that Salinas has engaged in any training programs related to earthquake response The designated EOC apparently does not have any emergency communication equipment. Some city officials voiced a concern that the city's main fire station may not be able to withstand a major earthquake, but no planning to account for this potential problem has occurred.

To the best of our knowledge, San Fernando does not have an emergency response plan. The city has not even applied to the state Office of Emergency Services for a grant that would pay for the preparation of an emergency response plan. The person specified as the Emergency Operations Coordinator is also the full-time City Engineer Despite the havoc caused in this small community by the 1971 earthquake, virtually no ERP has taken place in the subsequent decade.

Summary and Conclusions

In this chapter we have conceived of emergency response planning (ERP) as those planning activities undertaken before an earthquake with the goal of minimizing loss and making the actual response more efficient and effective. California law does not actually require preparation of an earthquake response plan. There are several sources of encouragement from the state, but no strictly enforced mandate to plan is imposed on local governments. Several previous observers have concluded that ERP in California is not very advanced and they have said that response to an earthquake (especially a catastrophic one) will probably be less efficient and effective than it might be.

In the course of our research on emergency response planning, we found that jurisdictions with recent earthquake experience were more likely to have incorporated some reference and evaluation of ERP in their SSE than those jurisdictions without recent earthquake experience. Similarly, more jurisdictions with recent earthquake experience have made a serious effort to implement SSE recommendations on ERP than was the case in jurisdictions without recent earthquake experience. With the exception of a few of the larger jurisdictions, ERP was the task of staff who also have other major responsibilities; the amount of staff time devoted to ERP in most jurisdictions is minuscule. Even in the larger jurisdiction, the full-time ERP staff is small. Both Los Angeles City and Los Angeles County have full-time ERP staff; these two jurisdictions have made considerable progress since 1971. Berkeley Fremont and Oakland are best characterized as being in a middle position. They have started some serious efforts on ERP in recent years, but their efforts and activities are modest and only a beginning. Salinas and San Fernando have placed ERP so low on their priority lists that it virtually does not exist.

This chapter started with a reference to a report by the Federal Emergency Management Agency in which serious concern was expressed about the ability of government to respond to catastrophic earthquakes. The report is more confident about the response to a moderate earthquake. Our research leads us to a slightly different viewpoint because FEMA did not single out any specific local governments. We have seen that some jurisdictions are more advanced than others in their ERP and will probably respond better, even to a catastrophic earthquake. While noting that none of our research jurisdictions have conducted ERP according to some theoretically possible maximum, learning from past experience has equipped some jurisdictions with a higher state of readiness. In other words, FEMA's blanket, across-the-board worry needs some refinement. We also take some exception to FEMA's conclusion that response to a moderate earthquake will not be a problem. Response to any damaging earthquake will create serious problems in some jurisdictions. This will probably be especially true for those jurisdictions that do not have very advanced (or any) ERP and also do not have recent experience with earthquake response.

CHAPTER 6

Footnotes

[1] Federal Emergency Management Agency An Assessment of the Consequences and Preparations for a Catastrophic California Earthquake: Findings and Actions Taken, Washington D.C., 1980, p 2.

[2] Will H. Perry "Disaster Preparedness Problems in California," Sacramento: California Seismic Safety Commission no date but probably 1977, p 1.

[3] Federal Emergency Management Agency op. cit., p.43.

[4] Dynes has written extensively about disasters but these particular definitions appear in Russell Dynes, "The Contribution of the Social Sciences to Emergency Planning " paper presented at the Third International Conference: The Social and Economic Aspects of Earthquakes and Planning to Mitigate Their Impacts, Bled Yugoslavia June 29-July 2, 1981. The definitions cited here all appear in this paper on pp 1-2.

[5] California Government Code, Section 8610.

[6] California Seismic Safety Commission "Goals and Policies for Earthquake Safety in California," Sacramento, May 10, 1979, p.37.

[7] Will H. Perry, op. cit., p 43.

[8] Los Angeles Times July 13, 1980, p 3, Part I.

[9] Federal Emergency Management Agency op cit p.7.

[10] Ibid., p. 10.

[11] Information about this Seismic Safety Commission study comes from the Commission's report, "Public Officials Attitudes Toward Disaster Preparedness in California," August 9, 1979 and Robert A. Olson and Stanley Scott, "Preparing for Earthquakes: Where Does California Stand?" California Data Brief Berkeley: Institute of Governmental Studies University of California, Vol 4, No. 3, October, 1980.

[12] Olson and Scott, op. cit., p. 6.

[13] Douglas C. Nilson, Linda B. Nilson, Richard S. Olson, and Bruce H. McAllister, "Planning Environment Report " for the Southern California Earthquake Safety Advisory Board, Redlands California 1981, p 23.

[14] Robert Rigney testimony to the Subcommittee on Science, Research and Technology U S. House of Representatives February 26, 1980, p. 5.

[15] Linda Cohen, Roger Noll, and Barry Weingast "Responses to Disasters: Planning for a Great Earthquake in California " California Institute of Technology Social Science Working Paper No. 131, August 1976, pp 11-13.

[16] <u>California Government Code</u>, Section 65302 [f].

[17] California Council on Intergovernmental Relations "Guidelines for Seismic Safety Element " Sacramento, September 1973.

[18] <u>Ibid</u>.

[19] The development of guidelines for implementation of a state law was a routine action by the Council on Intergovernmental Relations; it is commonly done by state agencies in their respective areas of expertise and responsibility The intent of any guideline is to give local governments some direction on the specifics involved in implementing a state law when the legislation itself may not contain the necessary detail. Nevertheless, it is important to remember that these guidelines are not mandatory.

[20] The Seismic Safety Commission reached a similar conclusion See Olson and Scott, <u>op</u>. <u>cit</u>., p. 4.

[21] As indicated in the previous chapter the city still considers fire stations structurally unsound. See <u>Los Angeles Times</u> December 12, 1982, p. 1, Part VIII.

[22] The largest water purveyor in the East Bay area (the East Bay Municipal Utility District) has undertaken ERP actions similar to those of the Los Angeles Department of Water and Power.

[23] Rachel Gulliver Dunn <u>Consensus Report of the Task Force on Earthquake Prediction</u>. Los Angeles: Office of the Mayor 1978. Federal Emergency Management Agency <u>op</u>. <u>cit</u>., p. 43.

CHAPTER SEVEN

Conclusions: Earthquakes, Acceptable Risk, and Facilitating Seismic Safety

The transcendent goal of all seismic safety policy is risk mitigation -- a reduced risk to life and property. We have argued that risk mitigation rather than risk elimination was the more realistic goal. Woven throughout the preceding chapters are numerous examples of efforts to mitigate risk.

In this last chapter we will draw some concluding observations about our original assumptions and arguments. We do this in two ways. Because so much of what occurs in the area of seismic safety policy relates to the goal of risk mitigation, we will first discuss the findings of the previous chapters in the context of that goal. This discussion focuses on the concept of "acceptable risk". The concluding section of this chapter examines our findings with respect to this question: What conditions facilitate the adoption and implementation of seismic safety policy in local communities? While not exactly a set of policy recommendations, our answers to this question highlight some reasons for the varied status of seismic safety policy in our research communities.

A brief review of some assumptions guiding our research effort will provide a context for the present chapter. Our research design assumed that it was important to distinguish between communities that had recent experience with an earthquake and those that had not. We also differentiated our sample of jurisdictions by population size and their location, whether in a metropolitan area or in relative geographical isolation. Another assumption was that seismic safety would be a somewhat conflictual policy area and, therefore, political influence would be wielded by opposing elite factions seeking political victory

The governmental decision-making process for seismic safety was characterized in Chapter 1 as composed of a series of phases; a problem or issue would move -- not always in a straight line -- through these phases. We indicated our special interest in the implementation phase Implementation of seismic safety policy, we assumed, would be similar to any policy implementation: there would be delays, differences over implementation strategy, and less than total accomplishment of goals. We argued that one reason seismic safety policy implementation would exhibit these characteristics is the relatively intractable quality of seismic safety problems.

Acceptable Risk

In the post WWII era, there has been a strong tendency for all Western nations to reduce risks individuals face by transferring responsibility for risk mitigation or elimination to society, i.e., government. When Yair Aharoni says, "risks have been socialized," he is referring to risks from economic instability, sickness, disability, man-made technology and natural hazards.[1] Risks that individual citizens face from earthquakes exemplify this trend. Because earthquakes produce an ever-present and certain risk to those who reside in California, government has assumed a role -- indeed, a preeminent one -- in addressing this natural environmental hazard.

Governments in California have responded in several ways in an effort to reduce risk. Every city and county in California is mandated by the state to plan for an earthquake; that is, to take steps that presumably will mitigate the consequences of an earthquake. The plans are contained in formal documents such as the Seismic Safety Element (SSE), the local jurisdiction's emergency response plan, and the Uniform Building Code or its equivalent. However, planning and code adoption are only the first step in risk aversion behavior; implementation of plans is also necessary. To the extent that government affects societal risk levels, a combination of planning goals and implementation efforts represent a _de facto_ commitment to a level of risk for a community.

While the policy context for seismic safety risk level decision-making is shaped in part by the state and federal governments, this research has primarily concentrated on the context in which and the processes by which risk decisions are made in California local governments. As we will show, setting the level of risk acceptable to a community requires the use of a rational decision-making process. This section, however, argues that risk level decision-making is a good example of incremental policy-making, and that makes the seismic safety policy area no different than many other policy areas. Despite extensive discussion of "acceptable" risk in both the academic literature and amongst practitioners, the rational or comprehensive decision-making suggested by this concept is so out of character in an incremental world that it has become a hollow concept in practice.

Risk analysis is not an explicit, visible undertaking in the local decision making process on seismic safety matters and consequently local officials exhibit little specific knowledge of existing or potential risk. This leaves California communities without a defined level of what risk is acceptable. By default, the status quo becomes the acceptable risk at any point in time. From the perspective of local government, whatever is current policy procedures an environment that is safe enough.

Acceptable Risk and Societal Risk Analysis

Over the last few decades social and physical scientists have paid increasing attention to the concepts of risk risk level decision-making and acceptable risk. Technological advances, accompanied by corresponding risk of sometimes unknown or little understood nature, have been the driving force behind this new awareness of societal risk Much of this literature, then, grows out of concern for such risks as those associated with nuclear energy production or toxic chemical wastes. However these origins do not detract from the applicability of the ideas to considerations of risk from natural hazards. There is also a body of literature that does have its original foundations in social science concern about natural hazards.[2]

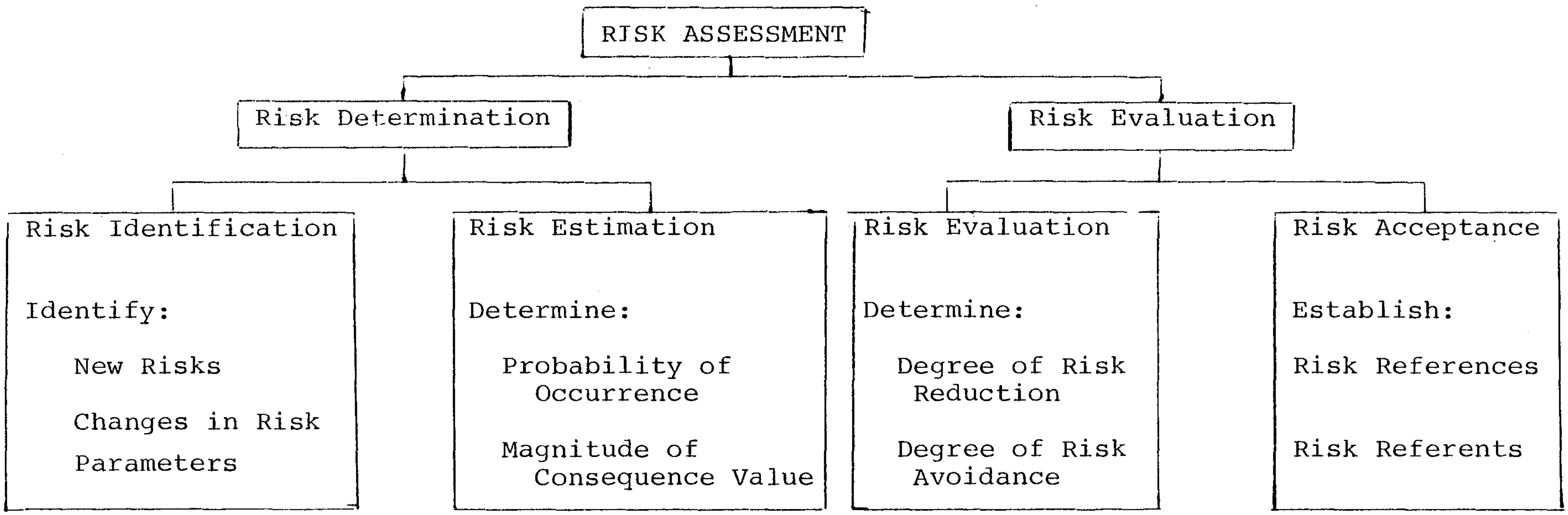
William Rowe provides a thorough and carefully reasoned introduction to the concepts of risk risk assessment, and acceptable risk. Rowe defines risk as "the potential for realization of unwanted negative consequences of an event".[3] Because risk concerns potential situations, there is always an element of uncertainty or probability in assessing risk. In stressing the negative consequences of an event, Rowe chooses to ignore the possible long-term advantages that can accrue to individuals or communities following an event. For instance, one can argue that the town of Valdez, Alaska received long-term benefits from the 1964 earthquake inasmuch as the entire town was rebuilt in a safer location four miles from the original landslide prone site.[4] However Rowe´s emphasis on negative consequences seems appropriate because it is simply too perverse to argue that devastating earthquakes, with all the associated death and destruction, are beneficial events for society. For most of those exposed to risk the consequences of the event are usually negative, and increasingly so as the risk expands.

Rowe presents a model of "risk assessment" that has several useful features in a discussion of seismic safety policy-making. Figure 7-1 displays the Rowe model. The major ingredients of the model are explained by Rowe:

> The term "risk assessment" is used here to describe the total process of risk analysis, which embraces both the determination of levels or risk and the social evaluation of risks. Risk determination consists of both identifying risks and estimating the likelihood and magnitude of their occurrence. Risk evaluation measures both risk acceptance, or the acceptable levels of societal risk and risk aversion, or methods of avoiding risk as alternatives to involuntarily imposed risks.[5]

Unfortunately the schematic presentation of the risk assessment model as seen in Figure 7-1 suggests a static model rather than a dynamic process. Rowe's subsequent discussion of the model, however, indicates the process nature of it. Risk assessment invokes a several stage process starting with risk determination. The logical progression moves from risk identification to risk estimation and then to risk evaluation of the risk aversion probabilities and risk acceptance preferences. As with all models, this one hints at too much orderliness and straightforward movement; social and political decision-making is never that neat.[6] Nevertheless, Rowe's conceptualization is helpful because it offers a picture of a comprehensive risk assessment process. It is against this model that we can compare the way in which local governments assess risk from earthquakes.

Figure 7-1: Risk Assessment Model



Source: W.D. Rowe, "Introduction to Risk Assessment," in G. T. Goodman and W.D. Rowe, Energy Risk Management. London: Academic Press, 1979, p. 11.

Another advantage of the Rowe model stems from its separation of risk determination from risk evaluation. The tasks of identifying risks and estimating their probabilities of occurence and magnitude of consequences -- all part of the risk determination stage -- are usually performed by technical experts. On the other hand, public officials, both elected and appointed, usually determine how to avert and/or accept risk. Although the policy-making world is not as sharply divided as the model suggests, this division between technical expertise and public officials' decision-making is reasonably accurate. The work performed by technical experts is of interest to students of public policy-making because of its important agenda setting function. What geologists, seismologists, structural engineers, and behavioral scientists identify as the risks, probabilities, and magnitude of consequences from a seismic event has a major impact on risk evaluation by public officials. To that extent, we must understand the interaction between risk determination and risk evaluation; but our major focus is on the activities of public officials as they evaluate risk.

The first two steps in risk evaluation call for a determination of the degree to which risk _should_ be reduced and the degree to which risk _should_ be avoided. The normative conclusions establish an acceptance level of risk ranging from a (theoretically possible) state of no risk to an acceptance of the full degree of risk imposed by the natural hazard. We then see the emergence of a level of acceptable risk. Rowe's definition of acceptable risk is deceptively simple: "A risk is acceptable when those affected are generally no longer (or not) apprehensive about it."[7] In other words, individuals will accept some risk and not become apprehensive about it, but at the point at which they are apprehensive it is no longer acceptable. The "affected" in Rowe's definition includes both those who are making the decision and those members of the public who are in any way potentially impacted by the natural hazard and the level of risk deemed acceptable. The practical difficulty of knowing the public's apprehension is immediately evident. Governments seldom undertake systematic evaluations of public opinions and fears about such matters prior to making decisions. Shorthand techniques, such as public hearings and analysis of communications received, usually substitute and provide partial evidence of the level of apprehension about risks. As will be argued subsequently, the public official's <u>perception</u> of the affected population's apprehension is a relevant variable in seismic safety risk evaluations.

Even those such as Rowe who build "ideal" models of risk assessment processes acknowledge that some risk is acceptable or will be found so by those making the decisions. The conditions under which some risks might be found acceptable are subject to value judgments by the affected.

Again we can turn to Rowe for clarification He suggests the conditions under which risk is deemed acceptable:

1. A risk is perceived to be so small that it can be ignored.
2. A risk is uncontrollable or unavoidable without major disruption in lifestyle.
3. A credible organization with responsibility for health and safety has, through due process, established an acceptable risk level.
4. A historic level of risk continues to be an acceptable one.
5. A risk is deemed worth the benefits by a risk-taker [8]

Notice the necessity for judgment and discretion in all the conditions, including number three which at first glance appears to be different. Someone must decide that the risk is small or uncontrollable or worth the benefits; and someone must decide that the level of acceptable risk established by a "credible organization" is appropriate. For instance, when the state government establishes a policy that prohibits most construction within fifty feet of an active fault (i.e., the Alquist-Priolo Act) then it is setting a level of acceptable risk. Local governments can still exercise their judgment about that risk level and decide, for example, to prohibit construction in a wider zone.

Political decision-makers faced with questions of risk assessment must frequently engage in a politically motivated calculation. The political mathematics involve both their own careers and the community's needs. It is essentially a question of certain short-term costs versus possible long-term benefits for both themselves and their communities. Virtually all risk aversion strategies require the expenditure of money or political capital. The lower the level of risk found acceptable the higher the resource expenditure incurred at the time of decision making and shortly thereafter. Yet, most political benefits to decision-makers in the form of increased constituency support or appreciation and most benefits to the community in the form of fewer casualties and property damage from the event do not begin to accrue until the event happens.

Dennis Mileti explains the problem this way:

> Adjustments which enhance preparedness and reduce risk do not yield benefits until a low probability environmental extreme occurs; however, their associated costs begin to be incurred as soon as they are effected.[9]

The event may not occur during the tenure of those decision-makers who shouldered the costs, and it is possible that it will not occur during the lifetime of many in the community who paid for the lower level of risk in dollars or inconvenience. In sum, this discrepancy between short-term costs and long-term benefits is the basic political dilemma that makes risk assessment decision-making problematic. While the dilemma is present in situations of both man-made hazards and natural hazards, a tendency toward a more fatalistic acceptance of natural hazards and their risks makes risk assessment about phenomena such as earthquakes a different and slightly less urgent matter.

Seismic Safety Decision-Making and Risk Assessment

Three local government activities comprise the bulk of measures that might be taken to reduce seismic risks -- regulation of land use, enactment and enforcement of building codes, and emergency response planning. As we have pointed out before, local governments in California have front line responsibilities and broad discretion in these areas, even though operating under guidelines and general mandates imposed by the state. The actions of local governments in these three areas are a major determinant of acceptable risk in their communities. Keeping in mind that elimination of literally all seismic risk is not possible, local governments have made numerous policy decisions and implementation efforts which collectively define acceptable risk. A few examples will illustrate this point.

In addition to identification and analysis of the natural hazard itself, most SSE's contain recommendations for policy actions to reduce or avert risk. For instance, when a SSE recommends prohibiting construction in a certain area because of high landslide potential, or when it recommends the preparation of soils and geologic reports prior to building permit approval, it is essentially indicating that certain risks be averted and other risks reduced.

The building design standards enforced in a community are an important ingredient in determining acceptable risk. The virtually universal adoption of the Uniform Building Code by California local governments would appear to establish a uniform, consistent level of risk associated with buildings in every community. Such is not the case. Local governments exercise some discretion over building code enforcement activities -- that means they are deciding risk levels. For example, when a city council makes budgetary allocations to its building department, and thereby decides upon staffing patterns, it is indirectly setting risk levels. A building department that is seriously understaffed can not possibly give adequate attention to either design plans or on-site inspections, and this will increase the community's risk. In other words, actual implementation of building codes is what helps define the level of acceptable risk in a community, and it may differ from the intent of the model code.

Planning a governmental response to an earthquake must, of course, take place before the event. Herein lies the fundamental problem: how can one anticipate all the consequences of the event so that one can prepare your emergency response resources for their most efficient use? Learn from the past as you plan for the future is the simple answer. The thoroughness, accuracy and realism -- in a word, quality -- of the emergency response plan is part of the community definition of acceptable risk If a local government chooses to ignore emergency response planning or if the emergency response plan is weak and untested it is, *de facto* making a decision to increase the community's risk level.

Formal agenda status for items involving seismic safety (and risk level decisions) is infrequent. When on the agenda, decisions that affect risk levels in land use building codes and emergency response are usually made with low visibility. Nothing illegal is implied, but there is not much public participation or expression of interest by the media in these kinds of issues. Media attention is episodic and tends to focus on the points of sharp conflict in the political process, which only infrequently involves seismic safety. Of the three issue areas, land use tends to attract the most attention but even here the major controversies, and consequently the primary center of attention, are not usually matters of seismic safety. Therefore, participants in risk level decisions tend to be elected and appointed governmental officials such as planning department personnel and commissioners, building officials, city managers, elected legislators, and a few representatives of private interests directly affected by seismic safety decisions.

Changes in existing approaches to land use building codes or emergency response preparedness are made infrequently and then the changes tend to be relatively incremental. Once a jurisdiction adopts a General Plan with its SSE, the prevailing tendency after that is toward piecemeal effort at implementation. Building codes change every few years, but this usually amounts to the rather routine acceptance of the latest version of the UBC seismic design provisions. Likewise, acceptance of an emergency response plan by a legislative body tends to be accomplished without any fanfare and without having a major impact (or sometimes without any impact) on governmental activities. In sum, seismic safety activities and the accompanying risk level decisions are simply not a very high priority item for local government.

By examining the way in which local jurisdictions have implemented land use and building code related seismic safety policy, it becomes clear that only a few jurisdictions have attained even some of their stated objectives. And it is important to remember that most land use objectives in the SSE's were very modest, including such goals as collecting more information about the nature of seismic hazards. Resource allocation for implementation of seismic safety policy has been virtually nonexistent. Most jurisdictions have chosen not to allocate monetary or non-monetary resources in a manner that would permit fulfillment of the adopted goals; most jurisdictions have made only the slightest movement toward goal accomplishment. Whatever level of risk was accepted in the adoption of the SSE, very little has been done to make it a reality through policy implementation.

No better example of the unwillingness to make comprehensive risk assessments can be found than the case of the "old buildings". Most California cities still have buildings in use which were constructed before the adoption of building codes containing any seismic design provisions. The old buildings tend to be unreinforced masonry construction and are quite susceptible to collapse in a moderate or strong earthquake, with the resulting potential for a significant number of deaths and injuries. A comprehensive risk assessment process would (1) identify the nature of the risk and (2) estimate the probability of structural collapse and the magnitude of the consequences expected. Presentation of this information to authoritative decision-makers, who would have authorized the gathering of it in the first place, would then allow the decision-makers to seek ways of averting or reducing the risk. This would establish a level of acceptable risk for the community based upon an evaluation of the costs, risks, and benefits. Such comprehensive rationality in decision-making is given short shrift by most local officials. With the exception of Santa Rosa and Los Angeles, no other local jurisdiction has even attempted to complete the risk identification and estimation phases let alone the risk aversion and acceptance phase of the Rowe model. (See Figure 7-1.) While acknowledging the "old building" problem, most local decision-makers prefer to allow these buildings to live out their economic usefulness and only then be replaced by newer structures. Slow, incremental change is the preferred option, and it is the option selected without the benefit of a risk assessment.

Risk level decisions are sometimes the inadvertent by-product of budget decisions. Building departments offer a good example. Because the Uniform Building Code (UBC) is not prepared by the local government, its adoption is usually routine, at least with respect to the seismic design provisions. No choice of risk level is available for the local government when it adopts the UBC. However, the way in which the UBC is implemented is subject to local discretion and this in turn affects the risk. As we pointed out above, budget determinations for building departments can either lead to less than full implementation of the UBC's intent or to implementation of the intended level of risk. Minutes of city council and board of supervisors meetings and interviews with local officials provide no evidence that local budget hearings and final budget adoption consider the risk level impact of the decisions being made. There may be some implicit understanding by decision-makers that their budgetary decisions affect risk levels, but neither the public record nor private interviews indicate this.

Risk level decision-making in local governments, then, is characterized by low visibility incrementalism, and low priority.

Nature of the Risk Assumed

Understanding the magnitude and nature of the seismic risk to which a community is exposed would seem to be important knowledge for local officials to possess. Therefore, by looking at the perceptions of magnitude and knowledge of risk held by elected and appointed local officials we can understand the quality of the deliberations which are made in the risk aversion and risk acceptance phases.

Knowledge of Risk. Every jurisdiction's SSE provides a basic introduction to seismology earthquake mechanics, and the types of damage that result from ground rupture, ground shaking, landslides, etc. These SSE's are adopted policy and an overwhelming majority of those interviewed were in office at the time of adoption. Additional learning opportunities come from the mass media and activities of several private organizations such as the League of Women Voters and geological and engineering associations.

Local officials, especially those who are elected, are not very knowledgeable about earthquake mechanics or about the types of damage earthquakes cause. They have, in other words, a low understanding and frequently inaccurate perception of either the process of or the product of the risk identification and risk estimation efforts which they have authorized. It is the rare official who shows anything other than the most basic understanding about earthquakes. A few quotations will provide a flavor of the misinformation:

> There is no risk here because there are no faults under the large buildings. (County supervisor.)
>
> Risk is low in our district because we only have the (major and active) fault in our district. (Assistant to county supervisor)
>
> We don't have to worry about the older buildings because you can't guarantee that the new buildings will stay up in an earthquake. So why get all bothered about seismic safety? (City council member)

Comments such as the above, and many others not reported, show how little time elected officials must have committed to acquiring an understanding of earthquakes and their associated risks. For instance, except for advocacy presentations with respect to specific proposed projects, only a very few of the elected officials interviewed admitted to having any contact with experts such as geologists, seismologists, or structural engineers. One must conclude that a risk level decision is usually not made with anything approaching full understanding.[10]

Magnitude of Perceived Risk. As detailed in Chapter 3, most public officials interviewed evaluated the seismic risk for their communities as either high or moderate; only a small minority characterized the risk as low. But at the same time most officials placed seismic safety policy quite low on the political agenda. Seismic safety is simply not a high or even medium priority item, and only a handful of public officials have undertaken any action to upgrade this status. What follows, then, is the conclusion that perceptions of moderate to high risks from earthquakes represents a risk level that most public officials choose to tolerate. Using Rowe's terminology, this level of risk is apparently acceptable. We now turn to a more direct consideration of how acceptable risk is defined in the research jurisdictions.

Perceptions of Acceptable Risk

Ultimately decision-makers must come to accept a risk level. This section looks at two questions: How do local decision makers define acceptable risk for their communities? Is the establishment of an acceptable risk level an explicit decision taken by local officials?

The most important conclusion from the interviews with elected officials and bureaucrats is in the form of a negative result: slightly more than one-half of the respondents were not able to express even an opinion about acceptable risk because the concept was totally foreign to them. Respondents were asked to define and/or explain the level of risk the local government had found acceptable. Despite repeated efforts by the interviewers to elaborate and refine the question so that each respondent understood the intent, most found it difficult to provide a meaningful answer.[11] The type of non-response considered here is different than the usual "don't know" answer in which the respondent is unable to indicate an opinion or position because of an inability to decide. Many of our respondents had not even considered the concept of acceptable risk and when it was explained to them they were unable to make it relevant to their experience.

Of the remaining respondents, several interesting categories can be identified. The next most common remark came from elected officials and several bureaucrats who concluded that their jurisdiction had assumed a high level of risk to be acceptable; local government had not taken any significant risk aversion or reduction steps. Essentially, they were saying that acceptable risk should be thought of in terms of what was being done to mitigate risk. Because mitigation was minimal the subsequent risk was high.

A few city council members expressed the opinion the "no risk is acceptable." They were unwilling to admit that any level of risk greater than zero was acceptable. However, the record shows that none of these council members had ever taken the initiative or had been very supportive of measures which would have reduced risk in their communities.[12] In response to the question about acceptable risk, they were taking a politically "correct" position by not being willing to accept any risk. As a practical matter, this type of position has the effect of ignoring the cost-benefits-risk calculations that must be incorporated in an acceptable risk decision.

Only two respondents, both city council members, defined acceptable risk by making reference to formal policy documents. One indicated that his city's definition of acceptable risk for the downtown area was contained in an ordinance that called for rehabilitation of structurally unsafe buildings. The ordinance contains specific criteria for determining what is unsafe, and that determines what risk is acceptable. The other council member suggested that acceptable risk was defined in his city by the SSE when it indicated that no construction should be permitted within a certain distance on either side of an active fault. These two council members were the exception: they both felt that their jurisdiction had taken an action to define level of risk.

When the above comments are added to the few respondents who were unable to make up their minds about the level of acceptable risk in their community (but who clearly did understand the concept), it is apparent that acceptable risk is not a widely used operational concept. Very few respondents even realized that they were involved in the setting of risk levels when they made decisions about land use, building codes, or emergency response preparedness. To the extent that local governments set levels of acceptable risk, it is not an explicit decision but rather an implicit result of many separate and discrete decisions. We know of no instance when a city council or board of supervisors engaged in an open discussion of acceptable risk in concept or in application to their community.[13] What risk exists is defined by default because local officials generally ignore it.

Rationality. It should be apparent that seismic risk level decisions do not correspond to Rowe's rational comprehensive model. There are two complementary explanations for what has been described above.

First, seismic safety decision-making does not conform to the rational model for the same reasons that apply to other policy areas -- the assumptions do not hold. In the rational model it is assumed that decision-makers will gather and evaluate all possible information, and then carefully weigh their priorities and resources against their preferences among the consequences of the various problem solving alternatives being proposed. Time pressures, differences in decision makers' personal motivations and goals, and less than complete information usually do not permit these assumptions to work.

Second, there are serious limitations which impinge upon risk decisions.[14] For instance data may not be available, scientific knowledge may not have advanced enough, or scientists may disagree with each other. All this limits precision and can cripple even good faith efforts to be comprehensive.

There are also some serious questions for which no ready-made answers exist. We are not always sure how we want to manage risks: Which levels of government should handle what risks? Should government intervene at all in certain risks? What form of government regulation is appropriate? Should government use incentives instead of regulation? Furthermore, we are not entirely sure what rights individuals possess when they desire to expose themselves to risks. Or to look at the other side of that same coin, what right does government have to coerce risk aversion?

A brief examination of just a few of these questions will highlight the issues involved. For example, let us take the matter of whether government ought to intervene in this policy area and, in effect, force individuals to take risk aversion behavior. The nation has a long tradition of skepticism and mistrust toward governmental rules or procedures that coerce individuals' behavior. Rules that limit individual freedom to choose a lifestyle, including the location and design of residences and businesses, are always viewed with a wary eye. Many of these traditional attitudes have been diluted in the last several decades as we permit or even encourage government to regulate a variety of social and economic behaviors on grounds of serving a larger public interest. Nevertheless, it is far from a settled matter that local governments ought to be in the practice of telling individuals that, for instance, they must not build a house on potentially unstable soil. There is far more consensus about government's role vis-a-vis risks when it comes to structures that are open to the public or where large numbers of people are employed. However, many people still retain a philosophical uneasiness about governmental regulation, and that helps explain why seismic safety policy does not receive universal praise or support. And if there are still mixed emotions about the acceptability of the very idea of government regulation in the name of seismic safety, then subsequent questions about applying the concept of acceptable risk sometimes get lost in the shuffle.

Finally, we must admit that the value judgments required in risk assessment are very difficult. The values attached to the trade-offs are not self-evident, and reasonable people will assign different weights to the values involved.

So how safe is safe enough? Apparently, local government decision makers have not thought much about this question. As a consequence the level of acceptable risk in California communities does not have a clear definition. However, these same decision-makers are also sending a not-so-hidden message: despite our failure to operationalize a definition of acceptable risk, our current policies are producing a physical environment that we accept as safe enough given the benefits, cost, and risks. Of course, the message is usually implicit and not contained in any formal communication. Yet, a planning department director was candid when he indicated during an interview that acceptable risk in his city was whatever the city was currently doing or had already allowed to occur in land use or construction. The motto might be: whatever exists is acceptable and that is safe enough. To the extent that any decision makers have considered the ramifications of defining and implementing an acceptable risk concept, they quickly must face the political reality of advocating current public expenditures in hopes of their community realizing benefits at some uncertain future date. This is hardly an easy or popular position to advance.

There is no easy solution to the level of safety question. A value judgment must be rendered after a careful appraisal of appropriate information and analyses. No one level of risk can be established _a priori_. As Howard Raiffa recently wrote "In any particular policy or decision choice where safety is a concern there is undoubtedly a [sic] myriad of other concerns."[15] Governmental decision-makers -- particularly at the local level where they must decide upon land use, building code enforcement and emergency response preparedness -- have a major share of the responsibility for making value judgments on seismic safety policy. If local government does not take the lead in encouraging public consideration of the value judgments involved in determining levels of acceptable risk, it is unlikely that anyone else will. And so what?

Decisions made by default, as is the situation with acceptable risk, probably have a greater likelihood of producing unanticipated and unwanted consequences. Of course, value judgments must be made with less than complete informatin about facts and possible consequences. Nevertheless, to deny, as we have, the practicality of a rational or comprehensive model does not excuse ignorance and refusal to understand important concepts.

Open consideration of the trade-offs necessary to setting risk levels has several benefits simply as a result of the process itself. Both the public and decision-makers can increase their education about seismic safety and risk. Perhaps most importantly, public airing of risk level matters permits the "how safe enough" question to become a part of the policy-making process, and it encourages public officials to acknowledge their responsibility in this area.

Will more explicit and visible attention by local governments to risk questions produce a safer environment when the next earthquake strikes? The short answer is --

not necessarily, but probably. Some risks will be judged acceptable, as Rowe has indicated.[16] In the balancing of costs, benefits, and risks some risks will be accepted at even a high level. But when public attention is focused on risks and associated trade-offs, some reduction in risk levels is also likely.

Conditions Facilitating Seismic Safety

Our discussion of acceptable risk shows the inapplicability of a comprehensive rational decision-making model to matters of seismic risk. However, the discussion of acceptable risk should not convey an impression of total inaction. This would be a mistaken reading of the above section, and for that matter of the preceding chapters. To be sure, most local governments fall considerably short of their own stated goals. Yet, certain local governments have made important advances in reducing risk and overall there has been at least some risk reduction in all our research jurisdictions. We have also observed throughout this report that the research communities vary in their policies and actions. What accounts for the variations? Why have some communities taken more, and more significant, risk reducing actions than others? Or to put it differently, what conditions seem to facilitate adoption and implementation of seismic safety measures?

The remainder of the chapter offers several answers to these questions. We will argue that five factors facilitate or influence the adoption and implementation of risk mitigation policies by local governments: state mandates, previous earthquake experience, staff ability, attitudes of local governmental leadership and staff, resources, and competition from other issues. State mandates are an initial condition affecting all local jurisdictions, while the remaining factors can explain why some jurisdictions have mitigated risk more than others.

State Role

All California communities must respond to the same state mandates on seismic safety policy.[17] The state requires all localities to have an SSE, adopt the UBC, and the state strongly encourages local emergency response planning. These mandates are formulated in skeletal fashion, thereby providing latitude for local governments in the substance of their policies and actions. By imposing these mandates, the state puts seismic safety on the local agenda; local governments must give at least a modicum of attention to the subject. These mandates serve as instigators and without them most local governments would devote less attention, energy, and resources to seismic safety than they are currently. This viewpoint was supported by numerous local officials.

The attitudes of nearly all local officials about the appropriateness of state mandates were characterized by hostility. A certain tension between the state and local governments is an ever-present phenomenon in California politics. Yet, when pressed most local officials admitted that without state seismic safety mandates they would be doing less in this area. For those local officials who favor a strong set of seismic safety policies by their jurisdictions, state mandates furnish a rationale for their actions. When challenged they can respond, "But the state says we must do this."

Local officials are not complete innocents in the development of the state mandates. None of the state mandates has been adopted without involvement or input from local officials. Giving testimony at state legislative hearings is a common activity for local officials when a new state mandate is being considered. Some local officials can occasionally influence determinations of state agencies; for example, when the State Geologist is considering designation of a Special Studies Zone.

State seismic safety mandates, then, are an important initial condition in local governmental actions. Absent these mandates, risk mitigation efforts would be weaker and fewer in number.

Earthquake Experience

A very basic organizing assumption of this research dealt with previous earthquake experience. We assumed that communities which have had recent experience with a damaging earthquake would think about seismic safety differently than communities which have been spared from earthquake damage in the last decade. More specifically, we felt that local governments that had actually responded to an earthquake would adopt different policies and take different actions than other local governments that had not suffered a damaging earthquake within their jurisdiction. Although all the research jurisdictions are still subject to the risk of a major earthquake, our assumption was that the actual trauma, experienced by public officials who might still be in office, would lead to greater risk mitigation efforts and a more determined commitment to seismic safety goals.

Our assumption about earthquake experience appears to be valid. It became apparent as we examined policies and actions in land use planning, building codes, and emergency response planning that those jurisdictions with previous earthquake experience were more actively pursuing seismic safety goals. There are exceptions -- and notable ones in a few instances -- to this generalization, but a review of previous chapters sustains the view that having had a damaging earthquake usually makes a difference. Jurisdictions such as Los Angeles City, Los Angeles County, Santa Rosa, and Glendale seem to have learned from their experience. Although clearly at risk, the jurisdictions of Oakland, Berkeley, Alameda County, and Salinas seem noticeably less prepared for a damaging earthquake; Hayward and Fremont have taken some action, especially in land use planning, that places them somewhat closer to the earthquake experienced jurisdictions.[18]

Having made the argument that recent earthquake experience is associated with more extensive preparation for the next temblor, we should now explore some reasons for this. First, the time period immediately after an earthquake is a propitious one for developing seismic safety policy and instilling a willingness to take action because the damage is so readily apparent; and all of the "close calls" are still frightening. Second, having had an earthquake within your jurisdiction can be a significant learning experience for those officials charged with response to the event. Mistakes are made, weaknesses in response are visible, inadequate preparation and failures in planning become obvious. Finally, the earthquakes we have been using in this research -- San Fernando of 1971 and Santa Rose of 1969 -- were not major seismic events. Both earthquakes were of rather modest magnitude and the affected areas are at risk from substantially more powerful earthquakes. Nevertheless, both earthquakes caused major damage, loss of life, and in the case of San Fernando some unanticipated consequences for structures. The reality of a moderate earthquake causing such damage was not lost on many local officials. Part of the learning experience stems from a heightened recognition that earthquakes release devastating forces. To some extent, the 1969 and 1971 earthquakes served as warnings and several jurisdictions have given some heed to those alarms.

Staff Ability and Interest

When a jurisdiction employs staff with a background of education and training relevant to seismic safety, the jurisdiction is more likely to have made progress toward its seismic safety goal. An obvious example is the presence of structural engineers in the building inspection department. But a land use planner who has attended professional meetings on seismic risk mitigation or the fire department officer who has carefully evaluated the response to a recent earthquake so that the response plans can be improved are also examples of staff with ability to further seismic safety goals. Throughout this research we have observed that seismic safety is an issue of relatively low visibility and little political payoff and, therefore, only the determination of specialized staff members keeps the issue alive.

Attitudes and Leadership

Those jurisdictions which have taken serious steps to reduce risk in land use planning building codes or emergency response planning all have a small cadre of officials exercising leadership on seismic safety. In a given jurisdiction this cadre may be composed of both elected and appointed officials. However in most of these cases a few top level administrators provide the leadership with the tacit and usually invisible support from elected officials. Seismic safety is the type of policy area that tends to fall between the cracks without this leadership.

We have noticed in these officials a set of attitudes that seem to govern their approach to seismic safety. They reject a fatalistic attitude about earthquakes, perceive their jurisdictions to be at significant risk, and also believe that local government has a responsibility to take risk mitigation actions. These leaders provide incentives for subordinates to effectuate seismic safety policy. Occasionally, the incentives are negative ones, such as direct orders with clear negative consequences for noncompliance. A good example occurred in the city of Los Angeles during a simulated earthquake drill when a few city agencies were uncooperative with the personnel conducting the simulation. A direct call from the mayor's staff to the agencies' heads prompted the necessary cooperation within the hour. More commonly, however, these leaders employ positive incentives to encourage staff morale and sense of significant accomplishment in developing or implementing seismic safety policy.

Resources

It takes resources to develop seismic safety policy and an even greater commitment to implement it. Just as the resources of time, money, and energy are scarce in the private sector, so too in local government. Not only are the governmental resources scarce, but the competition for their use has been fierce; the immediate future portends even greater competition. Competing issues always threaten to displace seismic safety from the agenda. Because some communities possess fewer resources than others, more pressing and immediate needs may take precedence over any worry about earthquakes.

For a community to take action on an issue like seismic safety, one of two conditions must exist: (1) The local government must have some flexibility in its resources; or to put it differently there must be some slack in demands on time or money or staff energy. (2) Resources must be given to the community from external sources. The city of Los Angeles is an example of the first condition and Santa Rosa the second. Some flexibility in staff assignments and allocation of dollars exists in a government the size of Los Angeles. It is not a matter of Los Angeles being awash in money or excess staff, but size alone can provide the resource of time and trained personnel as long as leadership attitudes want to use these resources. It was different in Santa Rosa because the federal government's provision of redevelopment money gave the city an opportunity it probably could not have afforded in the absence of the external aid. To be sure, the leadership cadre we spoke about earlier seized the opportunity; indeed, they probably created this opportunity. But external resources were a necessity.

The city of San Fernando exemplifies a situation which meets neither of the two conditions of flexibility or external resources. Indeed, San Fernando may be at the opposite end of the continuum from Los Angeles or Santa Rosa. The city is a small, relatively poor community that does not have the governmental staff expertise nor the external funding that would permit serious attention to seismic safety even if local officials wanted to emphasize it.

Concluding Comments

In order to explore further the differences between jurisdictions as observed in previous chapters on seismic safety as a public issue, land use planning building codes and emergency response planning, this concluding chapter has discussed risk mitigation efforts. We have considered the applicability of the concept of acceptable risk and we have discussed several factors which appear to facilitate risk mitigation. Neither acceptable risk decision-making nor any of the facilitating factors is mutually exclusive; all interact with each other. For example, decisions about resource allocation or an attempt to define what risk is acceptable hinge upon not only availability of resources, but also the attitudes of government leaders, the presence of qualified staff, and the timing and nature of state mandates. Attitudes about resources are also conditioned by previous experience with a damaging earthquake.

We are not able to sort out a causal chain of events or attitudes, but future research might profitably undertake this effort. What is clear, however, is that an interrelated combination of factors must be at work in a jurisdiction that has made any progress toward mitigating seismic risk. Just as certain is the impossibility of adopting and implementing an all encompassing seismic safety policy. Comprehensiveness is not government's strong suit. Our previous discussion of acceptable risk emphasizes this point. Incrementalism, gradualism, and persistence has characterized those jurisdictions which have accomplished the most. Mitigation of seismic risk requires a long-term effort, and that is why it will always be problematic.

It would be helpful to place our research on local government seismic safety policy into the context of the previously published research discussed in Chapter One. As we pointed out there, very little of the published research on natural hazards or specifically earthquakes concentrates on government, although some research has incorporated an examination of government organization and behavior into a part of the investigation. Nevertheless, a sense of completeness requires that we comment on the relationship between our research and the small body of literature mentioned in Chapter One.

Anderson found that the 1974 Alaskan earthquake led to some changes in the way a few units of Anchorage City government organized their agencies for future disaster response.[19] Especially in the major jurisdictions affected by the 1971 San Fernando earthquake (the city of Los Angeles and Los Angeles County), the earthquake was used as a learning experience for future emergency response planning. Some organizational changes have occurred within agencies such as the Los Angeles City Fire Department, the Los Angeles County Fire Department, and the County Sherriff's Office. On the other hand, those jurisdictions without recent earthquake experience do not provide much evidence of any particular learning from the San Fernando or Santa Rosa earthquakes.

Land use planning for seismic safety has changed throughout the state since the 1969 Santa Rosa temblor. The state mandated Seismic Safety Elements account for most of the differences in approach. While the Elements have not lead to anything dramatic, they clearly have increased the salience of seismic safety in most jurisdictions. The earlier work of Spangle and Associates comparing pre- and post-earthquake land use in three cities hit by recent earthquakes concluded that land use trends in Anchorage and San Fernando several years after their earthquakes were essentially no different than the trends prevalent before the earthquakes.[20] However, Spangle reports that significant land use changes in downtown Santa Rosa were attributable to the earthquake's influence. Our research confirmed that finding and we detailed some explanations for Santa Rosa's utilization of the earthquake to accomplish a new set of land use objectives in the downtown area.

An important counterpoint to our research appears in the Turner, et al. survey of public opinion about government's role in promoting seismic safety.[21] The Turner research, conducted in Southern California, clearly demonstrates a strong public desire for local governments to adopt an activist approach to seismic safety policy. A majority of respondents indicated their policy preferences in a variety of ways, including a willingness to see increased public expenditures to further seismic safety in their communities.

When we interviewed local public officials and studied the process of governmental decision-making on seismic safety, we did not find much evidence of Turner's respondents and their neighbors translating their opinions into political activity. Local public officials report very little or no contact by their constituents on seismic safety matters. These local public officials also perceive their constituents as being aware of risks from earthquakes, but not being very concerned about the dangers or possible mitigation policy. When local governments are making seismic safety related decisions on land use, for example, public participation and expression of opinions is quite limited and usually unorganized. We can not be sure how completely Turner's survey results can be applied outside of Southern California, but its accuracy within that region should be high. Therefore what we must conclude, at least in Southern California, is that there is a gap between public opinion and officials' perception of that opinion. That gap is reinforced by the lack of visible political activity which would give expression to the public opinion.

Within the limits imposed by the use of different methodologies and somewhat different research goals, it is at least interesting to point out the divergence in the underlying conclusions of our research and those of Friesma, et al. and Wright, et al. [22] Both Friesma and Wright concluded that natural disasters do not produce long-term social or economic changes in the affected communities. We have observed otherwise. When it comes to seismic safety policy, having experienced an earthquake usually leads to a heightened awareness in some local officials, in contrast to public opinion generally, and this in turn frequently produces more stringent or earthquake-sensitive policy than in those communities without recent experience with an earthquake. This is true for as long as a decade after the disaster.

This brief comparison of our research with that of others serves as a reminder that knowledge about natural hazard policy-making is rudimentary. The seriousness of the risks faced by large numbers of people justifies continued research attention to seismic safety policy-making as well as public policy for dealing with other natural hazards.

CHAPTER 7

Footnotes

1 Yair Aharoni, The No-Risk Society. Chatham, N.J.: Chatham House Publishers 1981., p.41. Aharoni is not very sanguine about this tendency. He feels strongly that too much risk has been removed from individuals, to the detriment of society. The research of Ralph Turner, et al., discussed in Chapter One, demonstrates the public support in Southern California for a strong active governmental response to the risks posed by earthquakes. See Ralph Turner, Joanne Nigg, Denise Heller Paz, and Barbara Shaw Young, Community Response to Earthquake Threat in Southern California Part One, University of California, Los Angeles: Institute for Social Science Research 1980.

2 Since this section is not a full scale review of the risk literature, only a very few selected authors will be discussed here. For further attention to risk analysis see the material cited below and such other works as: Meinolf Dierkes, Sam Edwards, and Rob Coppock, Technological Risk. Cambridge, Mass.: Oelgeschlager, Guinn and Hain Publishers, 1980; Richard E. Carney, Risk-Taking Behavior. Springfield, Illinois: Charles C. Thomas Publisher, 1971; Robert W. Kates, Risk Assessment of Environmental Hazards. New York: John Wiley & Sons, 1977; W Lowrance, Of Acceptable Risk. Los Altos, California: W. Kaufmann Co., 1976.

3 William D. Rowe, Anatomy of Risk. New York: John Wiley & Sons, 1977, p.24. We rely upon Rowe so extensively because his approach is an attempt to be comprehensive and because it includes a nice balance between theory and practice.

4 For more information on the decision to relocate Valdez see William Spangle and Associates, Inc., Land Use Planning After Earthquakes. Portola Valley, California, 1980 and National Academy of Science, The Great Alaska Earthquake. Washington, D.C.: National Academy of Science 1970. (See volume on Human Ecology.)

5 William D. Rowe, "Introduction to Risk Assessment," in G T. Goodman and W.D. Rowe Energy Risk Management. London: Academic Press, 1979, p. 11. Rowe acknowledges an intellectual debt to Robert W. Kates, op. cit.

6 Lest we be accused of unfairly characterizing Rowe's position, it should be added that his written work gives ample evidence that he appreciates the deviations from his

model that occur in actual decision-making.

[7] W.D. Rowe. "What is Acceptable Risk and How Can It be Determined?" in Goodman and Rowe, op. cit., p. 328.

[8] Ibid., pp. 327-328.

[9] Dennis Mileti, "Human Adjustment to the Risk of Environmental Extremes," Sociology and Social Research, 64(April, 1980), p. 330.

[10] These conclusions coincide with those of Mileti in his review of recent literature on adjustments to natural hazards. See Mileti, op. cit , especially, pp. 337 and 339. We should also mention that there are exceptions to this generalization.

[11] Of course, it is possible that the question itself was faulty or that the interviewer was inept in posing the question. While not wanting to deny completely the possibility of either of these two explanations for the large percentage of non-responses, we would point out that careful attention was given to this question and its administration. In our opinion, responses are probably not an artifact of the questionnaire or the interviewer.

[12] The "record" referred to here includes an examination of the minutes from city council and board of supervisors meetings, interviews with local officials and a few community activists in each jurisdiction, and a review of local newspapers.

[13] The city of Los Angeles is again an exception, although only a partial one. Los Angeles' Seismic Safety Element contains the concept of "balanced risk," a variation on the more traditional acceptable risk approach. The balanced risk idea was briefly discussed in the course of the Element's adoption.

[14] This discussion draws upon William W. Lowrance, "The Nature of Risk," in Richard C. Schwing and Walter A. Albers, Jr., (Eds.), Societal Risk Assessment. New York: Plenum Press 1980, pp. 5-14.

[15] Howard Raiffa, "Concluding Remarks " in Schwing and Albers, op. cit., p. 339.

[16] See Footnote 8, supra.

[17] An exception to this statewide uniformity is the

designation of Special Studies Zones. A Zone is created only in the communities which include the major known active faults.

[18] The variations between earthquake experienced and non-experienced jurisdictions is mitigated somewhat by the efforts of some professional associations (engineers, geologists, planners, etc.) to disseminate information about the Santa Rosa and San Fernando earthquakes.

[19] William Anderson, Disaster and Organizational Change. Columbus, Ohio: Disaster Research Center, Ohio State University, 1969.

[20] William Spangle and Associates, op. cit.

[21] Turner et al., op. cit.

[22] H. Paul Friesma James Caporaso, Gerald Goldstein, Robert Linebeary, and Richard McCleary, Aftermath: Communities After Natural Disaster. Beverly Hills: Sage Publications, 1979; James D. Wright, Peter H. Rossi, Sonia Wright, and Eleanor Weber-Burdin, After the Clean-up: Long-Range Effects of Natural Disasters. Beverly Hills: Sage Publications, 1979.