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SOCIO-ECONOMIC ASPECTS
OF HAZARD MITIGATION*

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INTRODUCTION

Disaster mitigation measures consist of "policies and actions taken before an event which are intended to minimize the extent of damage when an event does occur" (Drabek, Mushkatel, and Kilijanek, 1983: 12). Such measures include land-use regulations enacted to control development and settlement patterns; decisions about where to locate particular facilities and projects; the application of design and engineering principles (e.g., through building codes) that are intended to make new structures more resistant; the retrofitting of existing structures to reduce future damage; measures taken to protect the contents of structures from damage and to protect building inhabitants; public works (e.g., dams, shoreline maintenance projects) undertaken to reduce disaster impact; and other policies and activities enacted beforehand to minimize the life-safety hazards, damage, and social disruption resulting from disasters.¹ Disaster mitigation efforts are developed and implemented at various levels: entire societies or multiple societies; regional areas within countries; cities, villages, and other local communities; organizations; and households.

Mitigation is usually distinguished conceptually from disaster preparedness planning in that mitigation typically involves

¹ Hazard insurance is sometimes considered a type of mitigation strategy. Although strictly speaking insurance merely spreads losses within a pool of policyholders, insurance can also reduce losses if it encourages the adoption of mitigation measures, e.g., through rate-setting.

relatively long-term efforts to reduce disaster vulnerability and aims at lessening disaster impact and severity, rather than enhancing the capacity to respond to an event when it occurs. Although the concept is used most often to refer to actions taken with respect to future events, in practice mitigation measures are often only considered after a disaster strikes, to contain losses should the event recur.

Of the four disaster phases, mitigation and recovery have been studied the least by social scientists; considerably less is known about these phases than about disaster preparedness and response. However, both mitigation and recovery have received increased attention in recent years, and there is a growing literature on mitigation from which some insights can be drawn. This paper first presents a general overview of research on hazard mitigation--which unfortunately consists mainly of studies conducted in the U. S. It then attempts to develop a framework for thinking about mitigation as a social process, rather than (as is too often the case) as the application of technical solutions to reduce losses.

U. S. RESEARCH ON HAZARD MITIGATION

The research conducted on hazard mitigation in the United States can be divided roughly into three main areas (see Tierney, 1989 for a more detailed discussion):

1. Studies on how various mitigation measures are developed, adopted, and implemented. Studies in this category address the factors that encourage or discourage the adoption of hazard mitigation measures at the societal and community levels. Research

in this area includes studies on the adoption of various earthquake hazard reduction measures at the state and community levels (Drabek, Mushkatel, and Kilijanek, 1983; Wyner and Mann, 1983; Wyner, 1984; Olson, 1985; Alesch and Petak, 1986; Berke, Beatley, and Wilhite, 1989); and on flood plain land-use regulations and the National Flood Insurance Program (Hutton, et al., 1979; Frey, 1983). Some of the work in this area focuses specifically on decision-making with respect to the adoption of hazard mitigation measures in communities that recently experienced a damaging disaster (see, for example, Mader, et al., 1980).

2. Studies on risk perception, attitudes, and behavior with respect to various mitigation programs and practices. Overlapping to some degree with the first category discussed, these studies focus on attitudes toward mitigation within the general public or among influential segments of the population, such as elected and appointed officials, as well as on the factors associated with taking mitigative actions. Representative studies in this area include work by Rossi, Wright, and Weber-Burdin (1982) and Mittler (1989) on how public officials perceive and assess various approaches to mitigating hazards; research on how members of the public perceive the earthquake hazard and what measures they take to reduce earthquake losses (Turner, Nigg, and Paz, 1986; Mileti, Farhar, and Fitzpatrick, 1990); studies on the factors influencing the adoption by households of strategies to protect against volcanic hazards (Perry and Lindell, 1989); and studies on decision-making with respect to the purchase of hazard insurance

(Kunreuther, et al., 1978; Palm and Hodgson, 1992).

3. Studies on the impact of mitigation measures. Mitigation measures may or may not achieve their objectives, and they can have intended and unintended consequences. Some research attempts to assess loss reduction measures and determine the extent to which programs achieve the desired effects when they are implemented. Examples include work on the impacts of earthquake-related land-use measures in California (Palm, 1981); special earthquake safety ordinances for older buildings (Tyler and Gregory, 1990); the National Flood Insurance program (Burby and French, 1980; Cigler, Stiftel, and Burby, 1987); and flood plain land-use policies (Burby, et al., 1988).

This listing of projects and topic areas is not meant to be comprehensive, but rather to provide a general idea of the kinds of studies U. S. social scientists have conducted on hazard mitigation. Much useful knowledge has been developed as a result of this work, and some conclusions can be drawn. First, the literature has shown rather conclusively that objective risk, perceived risk and mitigation efforts are at best loosely coupled. At the individual level, community residents may know they are at risk from a particular hazard, but fail to take necessary protective steps, because they lack the financial capability, because they do not understand the various mitigative options that are available to them, or because it doesn't make good economic

sense for them to do so.² At the community level, promoting mitigation is difficult even in situations where hazards are acknowledged. Where risks are not well understood, or where risk levels are perceived as moderate rather than severe, program adoption is even more difficult.

Second, the literature suggests that the current sociopolitical environment is not favorable toward hazard mitigation. In the U. S., many actions that can be taken to enhance hazard mitigation (e.g., land-use decisions, the adoption and enforcement of building codes) are the responsibility of the local governmental level. Local "policy environments" vary across the U. S., but for the most part the institutional and intergovernmental system works to discourage hazard mitigation (Nigg, 1991). With certain notable exceptions,³ mitigation is not addressed directly through national legislation, and decisions about how far to go in implementing mitigation programs are left primarily to state and local governments. One consequence of this

² With respect to the last point, for example, homeowners in California are given the option of purchasing earthquake insurance, but the premiums and the deductibles are so high that for many people insurance doesn't appear to be a worthwhile form of protection, given the level of risk. Earthquake insurance is such a "bad buy" for the average homeowner that many people who might benefit from it don't take advantage of it.

³ The National Flood Insurance Program and the Coastal Zone Management Act are examples of Federal government initiatives directed at hazard mitigation. A Federal earthquake insurance law that in its current form attempts to provide incentives for mitigation is currently being considered by Congress. Additionally, a Presidential Executive Order issued in 1990 mandates that seismic design and construction requirements be applied to new buildings constructed or leased by the Federal government.

pattern is that some states and communities have good programs in place to mitigate some hazards, while others have done little or nothing.

Approximately two years ago, the U. S. Congress requested the preparation of a report on the topic of earthquake hazard mitigation and the reasons why mitigation has been so difficult to achieve. Among the most prominent impediments to mitigation identified in the report were: insufficient leadership and direction from the Federal government level; the low priority given to the earthquake hazard by many state and local governments and by the general public; and the absence of clear financial incentives that would make earthquake hazard mitigation more feasible. The general conclusion of the report was that unless the Federal government makes certain mitigative actions mandatory, they are highly unlikely to be undertaken by sub-Federal levels of government or by the private sector (Federal Emergency Management Agency, 1992). While this report focused only on the earthquake hazard, these findings can certainly be generalized to other hazards.

A third point emphasized in the literature is that both disaster events and "champions" or "policy entrepreneurs" play an important role in promoting mitigation. Mitigation is normally difficult to promote; efforts to do so must overcome both organized opposition and institutional inertia. Disaster events sometimes provide "windows of opportunity" that allow for the adoption of mitigation measures (Alesch and Petak, 1986). Disaster damage can

make the need for mitigation dramatically apparent. Disasters may also mobilize groups not previously aware of or concerned about a hazard to press for mitigation, while temporarily neutralizing opponents.⁴ Additionally, disaster experience can make opponents aware of legal or political liabilities they face by resisting mitigation.

Unfortunately, however, disaster experience can have perverse as well as productive effects. Sociologists note that repeated experience with a particular disaster agent (e.g., seasonal flooding) can also result in the development of "disaster subcultures," in which households and communities learn to adapt to and live with the hazard (Weller and Wenger, 1973). They develop typical ways of responding when disaster strikes, but at the same time they may become so accustomed to experiencing particular disaster agents that they don't consider mitigating the hazard.

Even when a highly dramatic disaster event highlights the need for mitigation, hazard reduction is not likely to occur without the involvement of organized interests that "champion" mitigation. These groups mobilize support, help overcome opposition, do the technical work necessary to establish a basis for mitigation, draft legislation, design programs, and in general keep the idea of mitigation alive over time. The "champion" or "policy entrepreneur" role is often assumed by members of professional

⁴ Even distant disasters can do this. For example, the 1985 Mexico City earthquake helped generate support and weaken opposition for both statewide and municipal earthquake hazard mitigation measures in California.

groups (e.g., engineering societies, associations of building officials), scientists, and elected and appointed public officials.

GENERALIZING FROM RESEARCH ON MITIGATION

The literature has certain limitations, however. Studies have tended to focus on single mitigation strategies or policies, such as seismic building ordinances or flood plain management programs. And although there are a number of exceptions, much of the work focuses on particular community settings or states. Such an approach is very helpful for those who wish to obtain detailed information on individual cases. However, it also has drawbacks. Because of its focus, the literature lacks a broader theoretical orientation that would make it possible to think about the mitigation process and related activities in a more general sense. The literature, in other words, tends to look very specifically at the conditions affecting the adoption, implementation, and impact of single measures in specific settings, but does not go on to generalize about the mitigation process itself. Using previous research and other sources as background, I will next attempt to provide that more abstract or general context.

A Sociological Approach to Understanding Mitigation

We can improve our understanding of the hazard mitigation process by starting with two basic assumptions: that both risk itself and the opportunity to mitigate are socially structured; and that mitigation is essentially a social activity--specifically an attempt at planned social change. These two points are discussed briefly below.

1. Both risk and the ability to mitigate are socially structured.

Although worldwide large numbers of people still consider disasters to be "acts of God" and thus largely beyond human control, and although physical scientists tend to focus almost exclusively on the meteorologic, geologic, and other processes that trigger disasters, the social and policy sciences have always argued that disasters are fundamentally social phenomena. A situation is defined as a disaster not merely when physical event like an earthquake occurs, but rather when that event disrupts a vulnerable community or society, threatening people and things that are valued (Fritz, 1961).

Similarly, although physical and environmental events like earthquakes or hurricanes set the stage for the occurrence of disasters, the casualties, economic disruption, and other losses that result are primarily the product of social conditions and social processes. Risk is socially structured: societies, communities, households, and individuals experience disaster losses not as the result of physical forces, but rather because of broader social forces. For example, the worldwide trend toward urbanization is most pronounced in so-called "developing" countries, which by the year 2000 will contain most of the world's urban population. Future urbanized centers will be significantly larger and more congested. Since many urban areas are also subject to various hazards, and since growth in these areas can occur in a rapid and unregulated fashion, in the future even larger numbers of people will be at risk from disasters. Unless steps are taken to

mitigate hazards in the urban environment, losses will escalate (Jones, 1992). Features common to the so-called "developing" countries of the world include a virtual absence of land-use regulation; the proliferation of squatter camps and other types of illegal settlements, often in hazardous areas; environmental degradation; insufficient infrastructure to support the population and provide for health and safety; and almost total disregard for hazard mitigation (Tinker, 1984; Parker, 1992). These conditions, which are the result of macrosociological processes, provide the context in which disasters proliferate.

Rapid urbanization, undertaken with an almost total disregard for seismic safety, was a major factor in the high death tolls and immense physical damage in the devastating earthquakes that struck Tangshan, China in 1976 and Armenia in 1988. Population and resources are highly concentrated in major urbanized areas in Central America. These areas are also characterized by significant geologic and other hazards. Consequently, disaster vulnerability is very high in many parts of the region--as was recently demonstrated in the 1986 San Salvador earthquake, which killed as many as 1,500 persons, injured thousands, and did extensive damage.

An inverse relationship exists between economic resources and disaster vulnerability. Worldwide, less developed countries are significantly more vulnerable than the richer nations (Susman, O'Keefe, and Wisner, 1983). People with low incomes typically face greater threats to life safety and property than those who better off economically, and they have more difficulty recovering from

disasters (Bates, 1982; Cuny, 1983; Kasperson and Bowonder, 1989; for findings on the relationship between social class and victimization in Central American disasters, see Lavell, 1991).

Like risk, the capacity to mitigate is socially structured. Vulnerability and mitigation are two sides of the same coin. Disaster losses are a function of the ability to mitigate, and conversely, failure to mitigate means that sooner or later losses that could have been avoided will occur. Although opportunities are continually being missed, affluent societies are much more capable of allocating resources to hazard mitigation than are less well-off countries. For example, an earthquake like the moderate-sized event (Richter magnitude 5.4) that occurred in 1986 in San Salvador would likely cause only minimal damage and no life loss in Tokyo, because of the large investment Japan has made in earthquake hazard mitigation.

Relatively high resource levels appear to be a necessary (but certainly not sufficient) condition for the launching of many disaster mitigation programs by societies and communities, as well as for the adoption of some mitigation measures at the household level. Mitigation typically involves some degree of investment, whether by government, the private sector, or households. Although the size of that investment need not necessarily be large, and costs will vary depending on the strategies selected, there is always a cost attached to instituting new mitigation measures, which in the short term must be borne by someone. Given the declining GNPs, rampant inflation, and declining household incomes

in much of the "developing" world, as well as the current recessionary conditions in the Western industrialized countries and Japan, the outlook for hazard mitigation does not seem promising. Recent disaster experience also suggests that it is a mistake to rely on "market forces" or "enlightened self-interest" to bring about needed investments in mitigation.

Internationally, major institutional sponsors of development projects have become increasingly concerned with escalating disaster losses during the past decade and have begun to incorporate mitigation considerations into their policies. The World Bank, for example, has stepped up its efforts to take natural hazards and environmental impacts into consideration in its lending policies (see, for example, Kreimer and Munasinghe, 1991; Kreimer, Harth, and Quarantelli, 1990). The Asian Development Bank has also shown an increased interest in problems of hazard mitigation in developing countries in Asia and the Pacific (see, for example, Asian Development Bank, 1991). Although such strategies may eventually have an impact, results in the near term are not encouraging. In this region of the world, for example, a recent report by the Organization of American States observed (1991:4)

While the link between natural disasters and development has been demonstrated repeatedly, governments and lending agencies do not yet systematically integrate the consideration of natural hazards into project preparation. Past losses and the vulnerability of infrastructure have reached such levels that in some areas development assistance consists almost entirely of disaster relief and rehabilitation.

Taking this argument one step further, it becomes apparent that not only are risk and mitigation opportunities socially

structured, but so are choices among alternative mitigation strategies. That is, within a range of available strategies, sociocultural factors influence which mitigation approaches will be favored. This suggests (1) that those attempting to encourage the adoption for mitigation measures must understand the social settings in which they will be applied; and (2) that mitigation strategies that have been used and have proven effective in one setting may not be acceptable, or work in the same way, in another.

2. Hazard mitigation is fundamentally a social activity.

Some readers may consider this idea so obvious that it should not have to be stated, but I think the point needs to be emphasized. Because carrying out some mitigation strategies, such as the design and construction of structures to resist wind or seismic forces, requires detailed technical knowledge, there is a tendency to see the mitigation problem and its solution as essentially technical. The assumption is that when sufficient knowledge and appropriate techniques are developed and passed on to those who need them, mitigation will occur. However, this is clearly not the case. While hazard resistant designs may be developed and tested in the laboratory, they must be implemented in the real world, and at this point it is social factors that most influence what can be accomplished. Mitigation strategies typically stand or fall on their political, economic, and sociocultural feasibility--not on their technical feasibility."

Stating that the mitigation problem is fundamentally social does not mean that technical knowledge is unimportant to the hazard

mitigation process. Obviously, scientific knowledge and data are needed to identify hazards and make projections about short- and long-term risks. Code development is largely a technical exercise. To make buildings and other structures resistant to hazards, engineering solutions must be found. Community residents have to possess some basic knowledge about their vulnerability if they are to be expected voluntarily to implement hazard mitigation measures. But such knowledge, while a necessary condition for hazard reduction, is by no means a sufficient condition, and it may not even be an important contributor. Moreover, many effective hazard mitigation strategies require little technical sophistication.

Rather than being conceptualized as technical exercises, mitigation activities should be seen as social interventions or instances of planned social change (Dynes, 1991). Characterizing mitigation in this way has several implications. First, like any form of planned social change, mitigation efforts must overcome resistance. Moreover, since hazard mitigation typically falls squarely within a policy domain that is dominated by powerful economic interests--that is, by institutional sectors concerned with development, land use, infrastructure investment, construction, and real estate--that resistance is likely to be considerable. In the U. S., for example, strong political affinities exist at the local level between elected officials and development interests. As a result, politicians typically make decisions favoring high-status groups as a matter of course, unless there is strong organized community opposition (Stone, 1980). What

Molotch and Logan (1984: 484) term the "ideology of land-use intensification and local growth" is very influential, and mitigation is typically a minor consideration in development decision-making. Assuming, then, that the status quo (including disaster vulnerability) exists because it benefits powerful segments of society, introducing new hazard mitigation strategies is invariably difficult, not for technical reasons, but for political ones (for more extensive discussions, see Tierney, 1989; 1992).

Further, to have any hope of succeeding, planned social change must be carried out in an institutional environment that is conducive to effective implementation. This is the case whether the program in question involves maternal and child health, AIDS prevention and treatment, employment training, or hazard mitigation. And once again, as noted above, difficulties abound. One reason implementation is problematic is that many national, state, and local governments lack the capacity to institute and follow through on needed mitigation measures (for discussions that focus on the U. S. situation, see Rubin, Saperstein, and Barbee, 1985; May and Williams, 1986; May, 1991). Moreover, the same interests that oppose the adoption of loss reduction programs in the first place typically seek to block implementation and weaken enforcement of those measures that are adopted⁵. It is also not

⁵ For example, a state law was passed in California requiring that persons interested in purchasing homes be informed by real estate agents if the property in question was located within a zone adjacent to an active earthquake fault. The intent of the law was to provide information on the hazard to prospective purchasers.

uncommon for mitigation measures instituted after a disaster to be weakened over time, particularly if a damaging event doesn't recur. This situation was observed, for example, in Anchorage, Alaska, where land-use regulations enacted after the 1964 earthquake were relaxed over a period of years, eventually resulting in a return to pre-earthquake development patterns (Selkrigg, et al., 1984). Finally, like other social programs, interventions aimed at promoting mitigation may flounder because they are based on incorrect assumptions or models of behavior--such as the notion that educating people and changing their attitudes will automatically result in behavioral change (see Dynes, 1991 for a more detailed discussion of erroneous thinking about how to encourage mitigation).

CONCLUDING OBSERVATIONS

To generalize more broadly, the major sociocultural factors influencing the mitigation process consist of (1) beliefs and cultural practices; (2) the political economy; and (3) the activities of government and other important institutional actors.

Beliefs and Other Cultural Elements. With respect to beliefs, for example, it is not likely that hazard mitigation measures will be adopted in societies or communities where people define disasters as "God's will" or as inevitable natural occurrences (see Lavell, 1991 for a discussion of this idea as it relates to Central

Real estate interests had lobbied against passage of the law and succeeded in introducing language that weakened it. When disclosure became a requirement, real estate agents complied with the law, but did so in a way that provided little useful information to purchasers (Palm, 1981).

American countries). Other frequently-expressed ideas that work against mitigation are that it endangers progress by slowing down development and that it violates individual property rights. At a more general level, research suggests that hazard reduction strategies that are at variance with longstanding sociocultural patterns will not be adopted, regardless of their potential effectiveness (c. f., Aguirre and Bush, 1992).

The Political Economy. Although they are not a large segment of the research community in the U. S., some social scientists argue for a conflict-oriented view of disasters and hazard mitigation (see, for example, Brown and Goldin, 1973; Bogard, 1988; Stallings, 1988).⁶ This approach emphasizes the importance of social inequality, power differences, and political-economic forces in all phases of disaster. As the foregoing discussions have suggested, and as I have argued elsewhere (Tierney, 1989; 1992), a conflict perspective is particularly appropriate for the study of the mitigation process. Whether the unit of analysis is the single community or the community of nations, mitigation activity (or the lack thereof) can be linked to the operation of the political economy. Beliefs, attitudes and other social-psychological and cultural variables are of course important in understanding the mitigation process, but these variables only reveal part of the story. At a more basic level, mitigation practices are byproducts of the distribution of power and wealth in society and of decisions

⁶ This perspective is probably more widely accepted outside the U. S. (see, for example, Clausen, et al., 1978; Hewitt, 1983).

that are made concerning the allocation of resources.⁷ Mitigation efforts cannot be understood--or made more effective--unless these broader forces are taken into consideration.

The State. This point leads logically to a consideration of the role of the state in hazard mitigation. Government actions (and, conversely, failure to act) are extremely important determinants of societal and community vulnerability levels. The literature suggests government can play a variety of roles with respect to natural and technological hazards: (1) a "champion," actively promoting hazard mitigation (Lambright, 1985); (2) a "referee," mediating among various groups that are divided on the question of mitigation and helping to achieve a balance with respect to risks and benefits (Alesch and Petak, 1986); (3) a passive bystander or outright facilitator of practices that make disaster losses inevitable (as happens, for example, when government solicits or permits new enterprises and projects, even if they increase disaster vulnerability, in hopes of producing social benefits) (Shrivastava, 1987a; 1987b); or (4) an autonomous actor pursuing its own interests and producing hazards in the process (Clarke, 1985). Once again, which stance government takes depends on the social context. Government appears to be more

⁷ For example, in the developing countries of Latin America and Africa, disaster mortality rates are higher in countries ruled by authoritarian regimes that are supportive of economic elites than they are in more egalitarian societies. Correspondingly, these "corporatist" regimes, which emphasize protecting infrastructure and economic resources, tend to keep disaster-related property losses lower. In other words, deaths, injuries and monetary loss levels follow directly from policy choices that emphasize either people or property (Seitz and Davis, 1984).

likely to take positions actively promoting hazard mitigation when societal and community resource levels are high; when organized interests exist that actively promote hazard mitigation and call attention to lapses^a; when opponents of mitigation are politically weak; and when the governmental system has the capacity to enact, enforce, and encourage mitigation policies. If these conditions are not present, the government is likely to be unenthusiastic and ineffective in promoting hazard mitigation.

^a Groups promoting mitigation may include grass-roots citizens' groups, social movement organizations, lobbies, pressure groups, professional organizations, and other "champions." International organizations and development-related institutions also have the ability to influence hazard mitigation policy.

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