



**Bringing Social Theory to Hazards Research: Conditions and Consequences of the Mitigation of Environmental Hazards**

William C. Bogard

*Sociological Perspectives*, Vol. 31, No. 2. (Apr., 1988), pp. 147-168.

Stable URL:

<http://links.jstor.org/sici?sici=0731-1214%28198804%2931%3A2%3C147%3ABSTTHR%3E2.0.CO%3B2-L>

*Sociological Perspectives* is currently published by University of California Press.

---

Your use of the JSTOR archive indicates your acceptance of JSTOR's Terms and Conditions of Use, available at <http://www.jstor.org/about/terms.html>. JSTOR's Terms and Conditions of Use provides, in part, that unless you have obtained prior permission, you may not download an entire issue of a journal or multiple copies of articles, and you may use content in the JSTOR archive only for your personal, non-commercial use.

Please contact the publisher regarding any further use of this work. Publisher contact information may be obtained at <http://www.jstor.org/journals/ucal.html>.

Each copy of any part of a JSTOR transmission must contain the same copyright notice that appears on the screen or printed page of such transmission.

---

The JSTOR Archive is a trusted digital repository providing for long-term preservation and access to leading academic journals and scholarly literature from around the world. The Archive is supported by libraries, scholarly societies, publishers, and foundations. It is an initiative of JSTOR, a not-for-profit organization with a mission to help the scholarly community take advantage of advances in technology. For more information regarding JSTOR, please contact [support@jstor.org](mailto:support@jstor.org).

## **BRINGING SOCIAL THEORY TO HAZARDS RESEARCH**

### **Conditions and Consequences of the Mitigation of Environmental Hazards**

**WILLIAM C. BOGARD**

*Whitman College*

This article relates some examples of current research on the mitigation of environmental hazards to recent sociological work in the theory of action. My intentions are to isolate common themes in an otherwise heterogeneous literature, to encourage debate on mitigation issues, and to enhance the legitimacy of this research program by bringing it to the center of contemporary theoretical concerns in the discipline. Much of the current debate in the field of mitigation still harbors implicit ties to sociological functionalism. These ties are made explicit and critiqued. It is argued that functional conceptions of mitigation present an unbalanced picture of mitigation as a reaction to potential extremes in the environment to the neglect of mitigation's active role in altering hazard potentials.

**While the social mitigation** of environmental hazards has been the subject of sociological study for some time now, there has been relatively little concern with tying this subject to general contemporary sociological theory. Theoretical works that do exist in this area are more likely to deal with the concept of "disaster" than the concepts of "hazard" or "mitigation" (see Dynes, 1970; Quarantelli, 1974; Fritz, 1961; Barton, 1970; Kreps, 1982), while those that do explicitly deal with the latter usually do so only at the midrange level of organizational theory (White, 1974; White and Haas, 1975; Saarinen, 1982; Rossi, Wright, and Weber-Burdin, 1982; Mileti, 1980; Mileti, Drabek, and Haas, 1975).

Organizational accounts of the hazards mitigation process are undoubtedly important to our theoretical understanding of the

relations between society and the environment. They constitute one explanation of how features of the environment come to be perceived as threats and how social organizations subsequently emerge to counter those threats. Most organizational hazards research, however, is never related to a general sociological theory of action. Consequently, the ties that do exist to general theory remain implicit. Frequently, these implicit ties are to some variety of sociological functionalism or equilibrium theory that stresses the reactive character of social mitigation in bringing hazardous situations back to "normal." Within this framework, mitigation is defined as any action—collective or individual, public or private—taken to reduce the potential harm posed by an environmental hazard. In light of contemporary theories of action, such conceptions are both somewhat dated and no longer entirely adequate.

#### UNACKNOWLEDGED CONDITIONS AND UNANTICIPATED CONSEQUENCES OF MITIGATION

One of the central projects of Western sociology has been to trace the causes and consequences of rational action. Habermas (1984, pp. 3-7) has gone so far as to claim this project, generally speaking, as the primary legitimate focus of all sociological theory. While substantive problems of rational action are found in all the humanistic disciplines, theoretical sociology's interest historically has been in the diverse modes of rational action *per se*.

Rational action is traditionally conceptualized as goal directed, utilizing means chosen predominantly for their efficiency or efficaciousness in reaching those goals. Theoretical considerations of rational action are thus necessarily implicit in debates over public policy, economic choice, and political strategy in general, and for how these debates affect the mitigation of environmental hazards in particular (Slovic, Kunreuther, and White, 1974; Dacy and Kunreuther, 1969; Rossi, Wright, and Weber-Burdin, 1982).

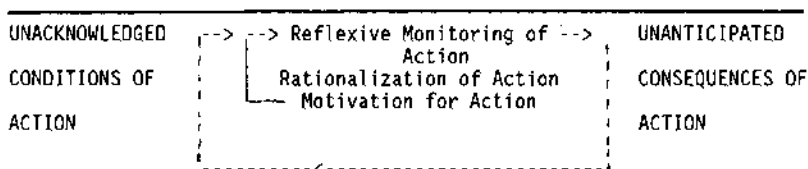
Early sociological theorizing took account of the fact that the social effects of rational action may themselves be irrational (or

nonrational). Both Marx (1963) and Weber (1958) frequently noted that the rational organization of society and the economy was capable of producing just such effects—alienation, bureaucratic red tape, dehumanization, contradiction, and conflict. This theme has continued in varied forms in subsequent theoretical work. Sociological functionalism, for instance, maintains that rational action can be explained by reference to its unintended, latent effects on social organization (Merton, 1957; Coser, 1971). Game theorists observe that strategic action, utilizing rational choice criteria, may lead to suboptimal or counterfactual solutions (Elster, 1978, Chap. 5). Such theories stress the fact that uncertainty and risk permeate the entire process of decision making. Recent research has also noted nonrational social effects resulting from the exclusion of policy alternatives from political agendas, or “non-decision-making” (Bachrach and Baratz, 1973). Finally, a whole literature has developed concerning the theoretical and practical limitations of rational choice models that must assume perfect information, homogeneous goods, and equal access to markets (see Simon, 1954; Lindblom, 1964).

In attempting to tie such diverse theories together at the level of action, Giddens (1979, Chap. 2) has argued that any adequate general sociological theory must account for the fact that all forms of rational action operate within a dynamic framework of unacknowledged conditions and unanticipated consequences. Giddens refers to this general process as “structuration,” a schematic representation of which is given in Figure 1.

Giddens terms the representation in Figure 1 a “stratification” model of action, insofar as to be adequately specified it must include general structural considerations about the distribution of power and resources in society. For the limited purposes of this article, however, the simplified outline of this model will suffice.

In Figure 1, the reflexive monitoring, rationalization, and motivation of action collectively refer to the fact that human activity is purposive, intentional, and feedback oriented. Actors are conceived as having the ability to account theoretically for their behavior utilizing the same social knowledge that is



SOURCE: From A. Giddens (1979). *Central Problems In Social Theory*. London: MacMillan. Used by permission of publisher.

Figure 1: A General Model of Action

implicated in the production of that behavior. The structures of social knowledge are, to use Giddens's terminology, both the media and the outcomes of rational social action.

Social knowledge, however, as the medium of rational action is neither complete nor always readily available in explicitly codified forms. What is known is often uncritically taken for granted (demarking the limits imposed by practical as opposed to theoretical knowledge), while what is not known forms a background of uncertainty. In either case, rational action is bounded by its unacknowledged conditions.

Precisely because of this bounded character, the outcomes of rational action are often unforeseen and unintended, that is, they can "escape . . . the scope of the purposes of the actor" (Giddens, 1979, p. 59). Within social theory, functionalism, with its concept of latent functions, has been the dominant perspective to express this viewpoint. The past years, however, have seen functionalism come under severe criticism in sociology.<sup>1</sup> This criticism has centered not so much on the notion of unintended effects of rational action, which clearly identifies a valid empirical concern, but on the problems of teleological explanation, anthropomorphism in the case of collective entities such as the state or society, and a tendency toward theoretical conservatism, reactionism, and equilibrium explanations of social action. In the latter case, sociological functionalism tends to overstress the *beneficial* unintended consequences of action for society rather than consequences that may be disvalued or disruptive (see Elster, 1983, p. 55).

In contrast to this, the theory of structuration developed by Giddens is antifunctionalist (Giddens, 1976). It does not rely on teleological forms of explanation, nor does it hypostatize societal

“needs” that social action functions beneficially to maintain in some form of equilibrium. How this is critical to a new conception of hazard mitigation will be explored in the next section.

In the literature on hazards, unacknowledged conditions of mitigation can refer to two things. A fair amount of work has been done to document the many unexamined popular myths that individuals hold (usually erroneously) about crisis behavior (e.g., the notion that persons tend to panic, loot, or generally behave egoistically in times of crisis). Much of this work on the unacknowledged practical consciousness of persons in disaster has yet to be theoretically systematized, although Wenger (1985) and Wenger and Friedman's (1986) work is noteworthy in this respect. Despite the obvious importance of this area of study, in this article I limit myself to a second concern more amply addressed in the literature, namely, the fact that mitigation irremediably operates against constraints imposed by uncertainty or the lack of information. Due to the variable predictability of disasters and their social impacts, uncertainty is endemic to hazards research and operates at many different levels. For practical purposes, however, most uncertainties can be classified under two broad headings to be examined below—uncertainty regarding the physical parameters of a future environmental event (e.g., onset, duration, or location), and uncertainty regarding that event's social impacts, for example, short- or long-term organizational responses to the event.

Unanticipated consequences of hazards mitigation on the other hand refers to those effects that modify the hazard potential in unintended and perhaps disvalued ways. The notion of a “hazard potential” is complex and somewhat resistant to definition. I shall do no more in this article than to characterize this notion as the probability of an object, event, or location to cause personal harm either as a feature of an individual or group's vulnerability or as an objective characteristic of the environment itself.<sup>2</sup> In general, the beneficial, intended effects of mitigation (reduction of losses to life and property) have been fairly well investigated (see Anderson, 1969; Perry, Lindell, and Greene, 1981). Potential negative consequences of mitigation (increased

vulnerability to a threat, increased hazardousness of a location, or cost shifts to particular social groups or classes, and so on) have been less systematically examined or tied to an overall theory.

White (1974, p. 3), one of the pioneers in this latter area, has noted the rather disturbing fact that placing flood mitigation in the hands of the federal government and increasing expenditures for such mitigation has actually appeared to increase vulnerability to losses from flooding. Although White's research was confined to the United States and indicated that losses were generally increasing only with respect to property and not to life, the implication that mitigation as a rational action could have disvalued effects for hazard potential was not lost to those investigating fatality rates from disasters in the Third World. Over the last twenty years, deaths from natural disasters in Third World countries have increased sixfold despite no evidence of any increase in the rate of actual physical events over this period (Wijkman and Timberlake, 1984, pp. 23-24; Hagman, 1984; Tinker, 1984). Much of the research in this area suggests that people's large-scale intervention into the environment, ostensibly to mitigate the potential for future disasters, has in part been responsible for this rise in casualties.

In theory, unanticipated, disvalued consequences of social actions such as mitigation can generate new structural parameters of knowledge for further action. This can be translated into saying that the range of uncertainties involved in mitigation changes with each mitigation effort and the effects it produces. Negative effects unavoidably feed back to alter the bounded knowledge the decision maker has of his or her environment, perhaps occasionally reducing uncertainty by allowing for the possibility of learning from mistakes, but never eliminating uncertainty altogether. At the midrange level, the general model of structuration thus becomes as follows (Figure 2).

The variable predictability of hazardous events and their potentially negative social impacts makes the study of mitigation strategies a useful illustration of the general theory of unacknowledged conditions and unanticipated consequences. Additionally,

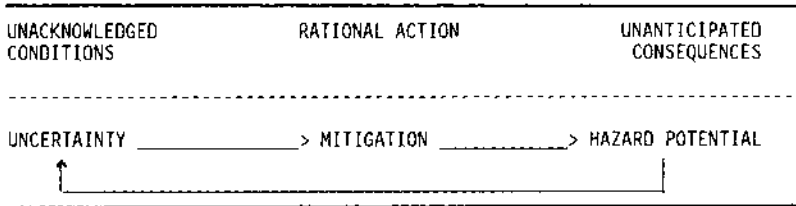


Figure 2: Midrange Model of Mitigation

focusing on the unintended, disvalued aspects of mitigation serves as a needed counterbalance to implicit functional theories of social action found in much hazards research. Finally, by examining the structure of informational constraints on the hazards mitigation process (and its potentially disvalued impacts), the possibility arises for bringing an element of critique to a literature not generally known for its criticism of social hazards policy. One such criticism concerns the traditionally accepted wisdom of conceiving mitigation as a response or reaction to hazards in the environment.

### PROBLEMS IN CONCEIVING MITIGATION AS A RESPONSE

It is necessary at the outset to reexamine some commonly held assumptions about the role of mitigation in hazards research. The theory of structuration suggests that mitigation cannot be conceived as a simple response, reaction, or adjustment to an actual or potential threat from the environment. Rather, mitigation is better conceptualized as a set of strategic actions that actively reshape and redistribute the social parameters of hazards. This view is not new but it has become more prominent in the hazards mitigation literature over the last decade (Turner, 1979; Wijkman and Timberlake, 1984; Tinker, 1985; Hagman, 1984). The contention is that this view represents an advance and the legitimate focus for a genuinely sociological investigation of hazards.

Sociologists have long recognized the need to include social factors in any adequate conceptualization of the hazards process.



In using the older vocabulary of "disasters," Prince (1920) noted that disaster could be functional in uniting a community for the task of recovery and rebuilding. Kutak (1938) observed that in disaster social role and status distinctions were overcome and that new normative patterns emerged in the process of coping with events. Studies such as these were the first to be concerned with the effects of disaster on social organization, particularly changes in the rules governing that organization. At a higher level of abstraction, these studies reproduced our commonsense idea of disasters as temporally bounded events in the environment necessitating a response. The content of that response, however, was perceived as constrained by certain essential features of disaster itself, as an event in the environment over which little or no control could be exercised. The unpredictability of disaster, its perceived externality to the routine of social life, its characterization as an "act of God," all entered into and reinforced this idea.

It is difficult for sociologists to extricate themselves from the tendency to see disasters as unique and temporally bounded, although unpredictable, natural events, and to some extent this older view has confused current research on hazards. The social aspects of disaster, when considered theoretically, have stubbornly remained temporally unbounded or at least indeterminate (e.g., the long-term effects of psychological stress or economic disorganization). Later research has recognized some of these problems by making a conceptual distinction between the physical aspects of disaster (utilizing such terms as "environmental extreme," "trigger event," or disaster "agent") and its social impacts (Mileti, 1980, p. 327; Dynes, 1970, pp. 50-51; Wijkman and Timberlake, 1984, p. 29). Much of this research was crucial in making the transition from the study of disasters to study of hazards, although in terms of establishing temporal bounds for the social impacts of disasters much work remains to be done (see Rossi, Wright, and Weber-Burdin, 1982).

With these problems in mind, the commonsense view of disaster that is taken over from the earlier disaster literature can oversimplify the complex relations between human and natural

environments, positing these relations as external and contingent rather than internal and necessary. Some of the current literature on hazards has attempted to remedy this simplification by forwarding a variety of strategies through which social organizations routinely interact with environmental extremes or triggers to mitigate their effects in terms of potential harm to human populations (Mileti, 1980; Dynes, 1970; Dacy and Kunreuther, 1969; Rossi, Wright, and Weber-Burdin, 1982; Quarantelli and Tierney, 1979; Anderson, 1969). There has been some progress, if not total agreement, in the extent to which these studies have been able to identify and categorize the multitude of mitigation strategies. At a general classificatory level, Mileti (1980, p. 329) has developed a typology of strategies that include settlement constraints and the reduction or redistribution of losses. Rossi, Wright, and Weber-Burdin (1982, pp. 4-9) identify typical strategies of mitigation as falling into four broad categories: (1) free market approaches, (2) relief and rehabilitation assistance, (3) technological fixes, and (4) land use management. Milliman (1982, p. 5) cites eight different strategies: (1) siting decisions, (2) land use regulations, (3) construction codes, (4) insurance, (5) warning and prediction, (6) evacuation and relocation, (7) emergency planning, and (8) relief and reconstruction aid.

While important for orienting our attention to various forms of mitigation, these typologies leave us with theoretical questions of how and why mitigation actually redistributes patterns of harm in disasters. One source of this problem is that mitigation has continued to be unreflectively defined in commonsense terms as a response to an actual or potential disruption of social life by an environmental event.

The hazards process itself is usually conceived as a simple linear causal process such as the following:

**ENVIRONMENTAL EXTREME → SOCIAL DISRUPTION – SOCIAL RESPONSE**

As theory and research on social interaction with the environment has become more sophisticated, it has been recognized that

theoretically it is misleading to place the environmental extreme variable at the beginning of the causal chain. It is more common today to find models that locate the physical parameters of extreme events in the middle of a temporal continuum and that thus enable one to speak of preimpact and postimpact stages in disaster (Mileti, Drabek, and Haas, 1975, pp. 14-23). Within these stages, analysis can then proceed to model strategic mitigation activities with increasing specificity and that vary with regard to their temporal relation to the trigger event.

Research during the 1970s and early 1980s made the first tentative steps toward the notion that such strategic activities constitute not only a simple response to extreme events, but also influence these events' potential for imposing losses (Haas and Mileti, 1976; White, 1974; Sorenson and White, 1980; Burton, Kates, and White, 1978; White and Haas, 1975). Much of this effort has been classified under the label "hazards research" as opposed to "disaster research." While the latter tends to emphasize explanations for various modes of response to environmental extremes, the former seeks explanations for adjustment to the risk of future disasters (Mileti, 1980, p. 328).

Emphasizing the idea of adjustment, however, has compromised the key insight of this research, namely, the idea of an *active* role for mitigation in altering the potential for harm from disaster. Essentially, there are at least three criticisms of utilizing the language of adjustment for hazards research, all of which are directed at its implicit ties to sociological functionalism.

(1) Problems of teleological explanation. The idea of adjustment in current hazards research still assigns causal primacy to the environmental extreme or trigger event itself in determining the content of mitigation, even if this event lies only in the future. Adjustment to future environmental extremes, however, if it is to make any sense at all, cannot be grounded on any *actual* features of these extremes, which are in any case known only uncertainly, but on our *expectations* concerning these extremes. These expectations are formed by experience with past events, whose actual features can be known and taken into account in the choice of mitigation. Simply stated, the expectations upon which choices

are made do indeed concern future events, but they are not caused by them.

(2) Closely related to this is the idea that decision makers concerned with hazards somehow react or respond to future environmental events. But again, it is the concern itself that forms the basis for decision and not any actual physical feature of the potential event itself. Mitigation, if it can be said to be reactive or responsive at all, has this character only in relation to such concerns, which can only be formed on the basis of past experience with hazards. Characterizing mitigation as a reaction or response to a future event has the theoretical result of making mitigation an *effect*, when the proper concern should be with how mitigation itself *produces* certain effects, that is, actively changes the parameters of the future environmental event with which it is concerned.

(3) Finally, the notion of adjustment to environmental extremes assumes that the relation of society to the environment can be directed through mitigation to achieve an equilibrium state. From this it is a short step to the assumption that society "needs" to be in balance with its environment, that is, needs to relieve the stress or strain resulting from potential environmental disruption. Society, however, has no such "needs," and to posit them is to transpose metaphorically features of individuals onto society itself. In this case, it makes far better sense theoretically to say that individuals simply take measures to protect themselves (or others) against hazards and to drop implicit ties to societal equilibrium notions. Again, the *effect* of such individual measures may or may not be a state of equilibrium, but equilibrium itself is not a prior theoretical reason or justification for taking such measures in the first place.

When individuals take measures to protect themselves or others against hazards, they do so with imperfect knowledge. And imperfect knowledge, whether in the form of popular myths about disasters or genuine uncertainties, leads to imperfect outcomes for adopted measures. These are outcomes that may, in game-theoretical terms, be suboptimal (everyone gets something but no one gets as much as they could) or even counterfinal

(everyone gets just the opposite of what was intended). The interplay between uncertainty and its unintended consequences for hazard potentials is a complex phenomenon, and in the following section I can provide no more than a few examples. These examples do, however, illustrate the usefulness of a theory of structuration to the area of hazards research and how diverse observations from various research pieces can be tied together within a comprehensive action framework.

### THE RELATION OF UNCERTAINTY AND HAZARD POTENTIAL TO MITIGATION

Habermas (1984, p. 8) has noted that an essential feature of all forms of rational action is their fallibility:

What does it mean to say that persons behave "rationally" in a certain situation or that their expressions can count as "rational"? Knowledge can be criticized as unreliable. The close relation between knowledge and rationality suggests that the rationality of an expression depends on the reliability of the knowledge embedded in it. Consider two paradigmatic cases: an assertion with which A in a communicative attitude expresses a belief and a goal directed intervention in the world with which B pursues a specific end. Both embody fallible knowledge; both are attempts that can go wrong.

The failure of action may occur both in the process of rational communication and in the technical rationality of means-end relationships. In both cases, failure reflects the bounded, that is, uncertain character of our knowledge. In both cases the action does not "come off"—it produces effects that may be clearly unintended or irrational.

Presumably, the intention of mitigation is to reduce the hazard potential within someone's environment, that is, to lessen the chance for harm to persons from future environmental events. If, however, all mitigations (as forms of rational action) are fallible, that is, if the knowledge embedded in mitigation is essentially uncertain, then the theoretical possibility is opened for mitigation to produce just the opposite effect of what it intends. In other words, mitigation may actually increase the hazard potential

within the environment due to outcomes that are unanticipated at the time choices concerning mitigation are made.

There are ready examples of this process. Relief supplies of food sent to regions stricken by drought are routinely seen as a necessary mitigation against famine, and they undoubtedly save many lives. But if too much aid is forthcoming (i.e., if too many nations act as outside suppliers), the result may be bottlenecks in distribution, economic disruption, or long-term dependence of populations on outside help (which may dry up as quickly as it materialized) (Hagman, 1984). In such cases prevention may actually be worse than the disease.

The content of aid itself, while both rational and well intentioned, may be totally inappropriate, as Wijkman and Timberlake (1984, p. 108) humorously yet grimly note:

Stories abound in the relief field of completely inappropriate aid: the British charity that sent packs of tea, tissues and Tampax; the European Community sending powdered milk into an earthquake area where few cows had perished, but there was no water; and the West German charity which constructed 1,000 polystyrene igloos which proved too hot to live in. But the igloos could not be dismantled or moved. They had to be burned down, and when burning gave off toxic fumes. Tins of chicken cooked in pork fat have been sent to Moslem countries which do not eat pork. Blankets donated to India were donated by India to Nepal, which donated them back to India; the blankets were never needed or used. Turkey after a 1983 earthquake asked donors not to send any medicine or second-hand clothes, but a Northern donor flew in a few days later with a planeload of precisely these items—and a TV crew to cover the distribution.

When everyone becomes involved in the relief game, the collective result can be chaos. But similar processes are at work in other forms of mitigation. If everyone tries to evacuate a location at once, the result may be that no one can get out in time (the classic illustration is the fire in a crowded theater). A warning siren that is tested only at 12 p.m. on Sundays will be useless for a disaster that strikes at 12 p.m. on Sunday, but if many *different* tests of a warning system are conducted at many different times no one might be able to distinguish a test from the real thing.

The phenomena referred to in the above examples illustrate the theoretical concept of counterfinality.<sup>3</sup> Counterfinality occurs when a set of actions, each of which is rational in the individual case, produces unanticipated and disvalued effects for the aggregate (Elster, 1978, pp. 106-122).

Perhaps the best known illustration of counterfinality in sociological theory derives from Marx's explanation for the falling rate of profit in capitalist societies (Marx, 1967, Chaps. XIII-XIV). Individual capitalists, seeking to increase their profits, mechanize their operations in an effort to reduce wage costs. But if all capitalists behave in this manner (which is rational for the individual capitalist), the outcome is an increase in unemployment and a lessening of the overall system's capacity to extract surplus labor. The result is a decline rather than a rise in the rate of profit. Individual rationality produces collective irrationality.

In the literature on hazards, examples of the operation of counterfinality are far from rare. Several authors have noted the desensitizing effect resulting from too many disaster warnings that prove to be unfounded (Anderson, 1969; Mack and Baker, 1961; Breznitz, 1984). When a real warning comes, no one believes it; features of the warning process actually inhibit action to counter the threat. To take perhaps a more far-reaching example, the clearing of forests in the Third World countries, rational for the individual or corporate landowner seeking to increase available land for agriculture, poses a greater threat of flooding for the collective by reducing the capacity of the land to absorb or divert the flow of water (Wijkman and Timberlake, 1984, pp. 57-62). The process of counterfinality is also evident in the case of pesticide use, a rational mitigation for the individual farmer seeking to increase agricultural yields, but that may engender long-term problems resulting from the development of resistant strains of insects, or "super pests" (Norris, 1982). It can be argued that most general hazards, such as those rising from the overexploitation of resources, pollution, and rapid population growth also exhibit features of counterfinality (Elster, 1978, p. 110).

Counterfinal outcomes for collective mitigation processes rest on two common and taken-for-granted assumptions: (1) that not

everyone will behave in the same fashion at the same time, and (2) that the actions of relevant others at time  $t_1$  will be roughly the same at time  $t_2$ . If each individual acts on one or another of these (supposedly rational) assumptions, the mitigative actions that ensue may be collectively irrational, that is, they may produce the opposite of their individually intended results. Action on the first assumption—that not everyone will do the same thing simultaneously—could result in the adoption of mitigation strategies that overtax a system's resources for coping with disaster. Mass evacuations, for example, have the possibility of placing such a strain on the available transportation system that evacuation is itself slowed down and perhaps more people exposed to a threat than if they had stayed at home (see Ruch, 1981). The aforementioned incapacity of states to deal with an oversupply of well-intentioned relief donors is also a result of action on this first assumption. In contrast, action on the second assumption—that actors will behave similarly between time  $t_1$  and time  $t_2$ —could result in mitigation strategies that produce adequate results initially but develop problems later (e.g., the "cry wolf" syndrome noted above). Potential victims (including those who issue warnings) often become desensitized to repeated false warnings.

Potential failures in mitigation arise not only from rational assumptions about the behavior of others, but also from the inability to form any expectations whatsoever regarding the outcomes of mitigations, that is, from classical uncertainty. Over the last 30 years, the theory of decision under uncertainty has generally come to replace classical conceptions of how rational choices are made.

Simon (1959, p. 253) has noted that classical decision analysis, which presupposes rational choice by actors regarding pre-given alternatives with known outcomes, is inadequate as a model for explaining how decisions are actually made:

The classical theory is a theory of a man choosing among fixed and known alternatives, to each of which is attached known consequences. But when perception and cognition intervene between the decision-maker and his objective environment, this model no



longer proves adequate. We need a description of the choice process that recognizes that alternatives are not given but must be sought; and a description that takes into account the arduous task of determining what consequences will follow on each alternative.

With regard to the selection and implementation of mitigations, uncertainties may for simplicity be grouped into two broad categories—those involving the physical parameters of an environmental extreme, and those dealing with social outcomes of the extreme event (Bogard, 1986). Uncertainties regarding the former include such factors as the time of occurrence (Graham and Brown, 1983), the magnitude of the event (Saarinen et al., 1985; Perry, Lindell, and Green, 1981; Moore, 1964; Savage et al., 1984; Sorenson and Gersmehl, 1980), the proximity of the threat (Diggory, 1956), and the recognition of the event itself (Anderson, 1969; Erikson, 1976). Uncertainties regarding social outcomes include the possibility of panic (Savage et al., 1984; Scanlon et al., 1976; Quarantelli, 1974), pressure from outside groups (Sorenson and Gersmehl, 1980; Gray, 1981), evacuation problems (Greene and Lindell, 1981), role ambiguity and conflict (Perry and Mushkatel, 1984; Erikson, 1976), and many more (Mileti, Sorenson, and Bogard, 1985).

Uncertainty generally arises from difficulties in obtaining or processing information (Turner, 1979, p. 55). One way these difficulties may increase a mitigation's potential for failure is by altering the timing of its implementation. Problems in obtaining or processing information may delay the notification of relevant authorities, the latter's notification of the public, or the decision to evacuate hazardous areas (Mileti, Sorenson, and Bogard, 1985). A warning or evacuation order issued too late may actually be worse than no warning being given at all, especially if it is hastily worded, conveys the uncertainty of officials, or generates confusion.

To return to the example of foreign aid, relief supplies often arrive too late to aid disaster victims substantially. Wijkman and Timberlake (1984, p. 110) have noted that the most pressing needs of victims are usually within 48 hours of a disaster. Information processing difficulties, however—often political in nature but

also those generated by the disaster itself—can cause delays. Aid arriving after this time can often interfere with victims' own attempts at recovery:

Human nature dictates that when a plane arrives with free goods, people will stop what they are doing and queue for hours to get whatever is available, whether they need it or not. Thus relief can actually slow down reconstruction and interfere with self-help.

Conversely, uncertainty may force mitigation to be implemented too early. Premature warnings may be forgotten, ignored, or unwisely acted on if a disaster does not materialize within a reasonably expected time frame. In the Bhopal tragedy, there was at least one individual who explicitly warned residents of the dangers of the Union Carbide plant years in advance, but as time went on with few serious accidents these warnings lost their salience (Bhandari, 1984, p. 104). The same process is also evident for natural hazards. Much of the debate concerning the issuing of warnings for earthquakes is based on the wide time frames that may separate the warning and the actual event. Action on warnings of this type may produce clearly unintended effects. Mileti, Hutton, and Sorenson (1981, pp. 112-114) have noted that such warnings have the potential for economic dislocations in the communities in which they are issued. Corporate enterprises may be dissuaded from making investments in areas that have been declared earthquake zones, this despite the fact of the tremendous uncertainties in pinpointing the precise time, location, or magnitude of the forecast event.

Finally, uncertainty can be a result of the complexity of mitigation itself. Difficulties in obtaining or processing information can be exacerbated by mitigations that are tightly coupled or interactive (Perrow, 1984). When multiple-function mitigations are involved (e.g., backup systems in nuclear deterrence), it becomes increasingly difficult (and takes increasing amounts of time) to pinpoint the exact location of particular mitigation failures. In extreme cases the result may be catastrophic. The complexity of the system designed to detect an incoming nuclear attack, for example, is so great that a false warning may not be

corrected in time to halt a decision for a "retaliatory" strike. Here the potential failure of the system negates any possible benefits that could derive from its implementation.

### CONCLUSION

The list of examples illustrating potential disvalued effects of the mitigation process can be easily extended. It has not been the purpose of this article, however, to suggest that *all* unanticipated consequences of mitigation are negative or disvalued. This is certainly far from the case, even though accounts of the negative effects of mitigation are quite common in the literature. The purpose, rather, has been to suggest a general sociological theory that, because of its generality, is able to unite diverse research observations on mitigation by providing them with a common theme, that is, the unacknowledged conditions and unanticipated consequences of rational action.

I have concentrated primarily on negative, disvalued outcomes of the mitigation process in this article because some theoretical balance needs to be achieved against the claims of functional theories of this process. These theories, if anything, tend to overstress the *beneficial* functions of rational action for society. The theory of structuration developed by Giddens does not deny that the effects of rational action may be beneficial for society, only that it is somehow their *function* to achieve such effects.

Functional theories of action implicitly underlie many organizational accounts of the hazards process. This is particularly evident in the use of the terms *response* and *adjustment* to characterize organizational relations to environmental events. These terms have the unfortunate feature of positing a reactive rather than active role for mitigation in changing the hazard potential of the environment.

The motivation for this article has been the well-noted fact that uncertainties are present in all forms of social mitigation. As conditions of all rational action, these uncertainties often result in counterfactual outcomes for the mitigation process. Empirically, we may find that these outcomes do or do not increase the overall

hazard potential of the environment. The point is that (a) they may in fact do so, and (b) this fact can be explicitly accounted for by a general theory of action.

## NOTES

1. However, see Alexander (1983) for what has been termed a revival of functional thought in sociology.
2. Most research on hazards contains at a minimum some reference to the idea of potential harm to persons, whether this harm is bodily, economic, or social-psychological. For work in this area see Burton, Kates, and White (1978), Hewitt and Burton (1971), and White (1974).
3. The game theory notion of suboptimality is also important in this context, but will not be addressed here. For a good discussion, see Elster (1978, pp. 122-134).

## REFERENCES

- Alexander, Jeffery. 1983. *Theoretical Logic in Sociology*. Berkeley: University of California Press.
- Anderson, William A. 1969. "Disaster Warning and Communication Processes in Two Communities." *Journal of Communication* 19(June):92-104.
- Bachrach, Peter and Morton S. Baratz. 1973. "Two Faces of Power." In *The Bias of Pluralism*, edited by W. E. Connolly. New York: Lieber-Atherton.
- Barton, Allen H. 1970. *Communities in Disaster*. New York: Anchor. Bhandari, Arvind. 1984. "The Avaricious Giants." *Tribune* (India) 19(December).
- Bogard, William. 1986. "Unacknowledged Conditions and Unanticipated Consequences of Hazards Mitigation." Paper presented at the 1986 Western Social Science Meetings, Reno, Nevada, April.
- Breznitz, Shlomo. 1984. *Cry Wolf: The Psychology of False Alarms*. Hillsdale, NJ: Lawrence Erlbaum.
- Burton, Ian, Robert W. Kates, and Gilbert F. White. 1978. *The Environment as Hazard*. New York: Oxford University Press.
- Coser, Lewis. 1971. "Social Conflict and the Theory of Social Change." In *Conflict Resolution: Contributions of the Behavioral Sciences*, edited by C. E. Smith. Notre Dame: University of Notre Dame Press.
- Dacy, Douglas C. and Howard Kunreuther. 1969. *The Economics of Natural Disasters*. New York: Free Press.
- Diggory, James C. (1956). "Some Consequences of Proximity to a Disaster Threat." *Sociometry* 19 (March): 47-53.
- Dynes, Russell R. 1970. *Organized Behavior in Disaster*. Lexington, MA: Lexington.
- Elster, Jon. 1978. *Logic and Society: Contradictions and Possible Worlds*. Chichester: John Wiley.

- 1983. *Explaining Technical Change*. Cambridge: Cambridge University Press.
- Erikson, Kai T. 1976. *Everything In its Path*. New York: Simon & Schuster.
- Fritz, Charles. 1961. "Disasters." Pp. 651-694 in *Contemporary Social Problems*, edited by R. Merton and R. A. Nisbet. New York: Harcourt.
- Giddens, Anthony. 1976. "Functionalism: Apres la lutte." *Social Research* 43(2):325-366.
- 1979. *Central Problems in Social Theory*. Berkeley: University of California Press.
- Graham, W. J. and C. A. Brown. 1983. *The Lawn Lake Dam Failure: A Description of the Major Flooding Events and an Evaluation of the Warning Process*. Denver: Bureau of Reclamation.
- Gray, Jane. 1981. "Characteristic Patterns of and Variations in Community Response to Acute Chemical Emergencies." *Journal of Hazardous Materials* 4:357-365.
- Greene, M., R. Ferry, and M. Lindell. 1981. "The March 1980 Eruptions of Mt. St. Helens: Citizen Perceptions of Volcano Threat." *Disasters* 5(1):49-66.
- Haas, J. Eugene and Dennis S. Mileti. 1976. "Socioeconomic Impact of Earthquake Prediction on Government, Business and Community." *California Geology* 30(7): 147-157.
- Habermas, Jurgen. 1984. *The Theory of Communicative Action: Reason and Rationalization of Society*. Vol. 1. Boston: Beacon.
- Hagman, Gunnar. 1984. *Prevention Better Than Cure*. Stockholm: Swedish Red Cross.
- Hewitt, Kenneth and Ian Burton. 1971. "The Hazardousness of a Place." Department of Geography Research Publication No. 6. Toronto: University of Toronto.
- Kreps, Gary A. 1982. "A Sociological Theory of Organized Disaster Response." Paper presented at the Tenth World Congress of Sociology, Mexico City, August.
- Kutak, Robert L. 1938. "The Sociology of Crisis." *Social Forces* 17(2):66-72.
- Lindblom, C. E. 1964. "The Science of Muddling Through." In *The Making of Decisions*, edited by W. J. Gore and J. W. Dyson. New York: Free Press.
- Mack, Raymond W. and George W. Baker. 1961. *The Occasion Instant*. Washington, DC: National Academy of Sciences.
- Marx, Karl. 1963. *The 18th Brumaire of Louis Bonaparte*. New York: International Publishers.
- 1967. *Capital*. Vol. 3. New York: International Publishers.
- Merton, Robert. 1957. *Social Theory and Social Structure*. New York: Free Press.
- Mileti, Dennis S. 1980. "Human Adjustment to the Risk of Environmental Extremes." *Sociology and Social Research* 64(3):327-347.
- T. Drabek, and J. Haas. 1975. *Human Systems in Extreme Environments: A Sociological Perspective*. Boulder: University of Colorado, Institute of Behavioral Sciences.
- Janice R. Hutton, and John H. Sorenson. 1981. *Earthquake Prediction Response and Options for Public Policy*. Boulder: University of Colorado, Institute of Behavioral Sciences.
- John H. Sorenson, and William C. Bogard. 1985. "Evacuation and Decision-Making: Process and Uncertainty." Prepared for the Office of Nuclear Safety. Unpublished.
- Milliman, Jerome W. 1982. "Economic Issues in Formulating Policy for Earthquake Hazard Mitigations." Prepared for NSF Workshop on Hazards Research, Policy Development, and Implementation Incentives, University of Redlands, California.
- Moore, Harry Estill. 1964. *And The Winds Blew*. Austin: University of Texas, Hogg Foundation for Mental Health.

- Norris, Ruth (Ed.) 1982. *Pills, Pesticides & Profits: The International Trade in Toxic Substances*. Croton-on-Hudson, N.Y.: North River Press.
- Pelanda, Carlo. 1982. "Disaster and Socio-systemic Vulnerability." Pp. 67-91 in *The Social and Economic Aspects of Earthquakes*, edited by B. G. Jones and M. Tomazevic. Proceedings of the 3rd International Conference, Bled, Yugoslavia.
- Perrow, Charles. 1984. *Normal Accidents: Living With High Risk Technologies*. New York: Basic Books.
- Perry, Ronald W., Michael K. Lindell, and Marjorie R. Greene. 1981. *Evacuation and Emergency Management*. Lexington, MA: Lexington Books.
- Perry, Ronald W. and Alvin Mushkatel. 1984. *Disaster Management: Warning Response and Community Relocation*. Westport, CT: Quorum.
- Prince, Samuel H. 1920. "Catastrophe and Social Change." Ph.D. dissertation, Columbia University, New York.
- Quarantelli, E. L. 1974. *Disasters: Theory and Research*. Beverly Hills, CA: Sage.
- and Kathleen Tierney. 1979. *Disaster Preparation Planning*. Columbus: Ohio State University, Disaster Research Center.
- Rossi, Peter H., James D. Wright, and Eleanor Weber-Burdin. 1982. *Natural Hazards and Public Choice: The State and Local Politics of Hazard Mitigation*. New York: Academic Press.
- Ruch, Carlton. 1981. *Hurricane Relocation Planning for Brazoria, Galveston, Harris, Fort Bend, and Chambers Counties*. College Station: Texas A&M University, Center for Strategic Technology, Texas Engineering Experiment Station.
- Saarinen, F., Victor R. Baker, Robert Durrenberger, and Thomas Maddock. 1985. "The Tucson, Arizona, Flood of October 1983." National Research Council, Washington, DC: National Academy Press.
- Saarinen, Thomas F. (Ed.) (1982). *Perspectives on Increasing Hazard Awareness*. Boulder: University of Colorado, Institute of Behavioral Science.
- Savage, Rudolph P., Jay Baker, Joseph Golden, Ashan Kareem, and Billy Manning. 1984. "Hurricane Alicia: Galveston and Houston, Texas, August 17-18, 1983." National Research Council on Natural Disasters, National Academy Press.
- Simon, Herbert. 1954. "A Behavioral Theory of Rational Choice." *Quarterly Journal of Economics* 69:99-118.
- 1959. "Theories of Decision-making in Economics and Behavioral Science." *American Economic Review* 49:253-283.
- Slovic, Paul, Howard Kunreuther, and Gilbert F. White. 1974. "Decision Processes, Rationality, and Adjustment to Natural Hazards." Pp. 187-206 in *Natural Hazards: Local, National, Global*, edited by G. F. White. New York: Oxford University Press.
- Sorenson, John H. and Philip J. Gersmehl. 1980. "Volcanic Hazard Warning System: Persistence and Transferability." *Environmental Management* 4(March):125-136.
- Sorenson, John and Gilbert F. White. 1980. "Natural Hazards: A Cross-Cultural Perspective." In *Human Behavior and the Environment*, edited by I. Altman, A. Papaport, and J. Wohwill. New York: Plenum.
- Tinker, Jon. 1984. "Are Natural Disasters Natural?" *Socialist Review* 78(14):7-25.
- Turner, Barry. 1979. "The Social Aetiology of Disasters." *Disasters* 3(1):53-59.
- Weber, Max. 1958. *The Protestant Ethic and the Spirit of Capitalism*. New York: Scribners.
- Wenger, Dennis. 1985. "Collective Behavior and Disaster Research." Preliminary Paper 104. University of Delaware, Newark, Disaster Research Center.

- and Barbara Friedman. 1986. "Local and National Media Coverage of a Disaster: A Content Analysis of the Print Media's Treatment of Disaster Myths." Preliminary Paper 99. University of Delaware, Newark, Disaster Research Center.
- White, Gilbert F. (Ed.) (1974). *Natural Hazards: Local, National, Global*. New York: Oxford University Press.
- 1975. *Flood Hazard in the United States: A Research Assessment*. Boulder: University of Colorado, Institute of Behavioral Science.
- and J. Eugene Haas. 1975. *Assessment of Research on Natural Hazards*. Cambridge: MIT Press.
- Wijkman, Anders and Lloyd Timberlake. 1984. *Natural Disasters: Acts of God or Acts of Man?* London: Earthscan.

*William C. Bogard is a Visiting Assistant Professor of Sociology at Whitman College. His current research interests include contemporary social theory and the social implications of technology.*