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# TOWARDS A CRITICAL SOCIOLOGY OF RISK*

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# Toward a Critical Sociology of Risk[1]

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*Sociologists are growing increasingly skeptical toward research on risk conducted in other fields, and new perspectives on risk are emerging. Topics that merit further exploration include the social construction of risk and risk objects, risk analysis as a type of scientific enterprise, the organizational and institutional forces that shape positions on risk, safety and risk as dynamic properties of social systems, and the social forces that create and allocate risk. In particular, sociologists need to place more emphasis on exploring the roles played by organizations and the state in hazard production and on formulating a political economy of risk. To a significantly greater degree than other disciplines concerned with risk, sociology emphasizes the contextual factors that structure vulnerability to hazards and the linkages that exist between vulnerability and social power.*

**KEY WORDS:** risk; risk analysis, social construction of risk· natural hazards; technological hazards; disaster research.

## INTRODUCTION

In his 1984 Presidential Address at the American Sociological Association annual meeting, James F. Short (1984) called for a social transformation of the study of risk and the practice of risk analysis, and he urged sociologists to become more involved in the scholarly and policy-oriented dialogues that were taking place in the field. He argued that the development of a sociological perspective on risk-related phenomena would not only enhance

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the study of risk, but would also place the field of sociology at the center of important societal debates and controversies to which the discipline can make a unique contribution.

Major disasters have occurred since that time that have further highlighted the importance of Short's message. Those events include technological disasters such as the 1984 chemical release at Bhopal, the 1986 Chernobyl nuclear disaster, and the 1989 Exxon oil spill, as well as massive natural disasters, such as the 1985 Mexico City earthquake, the 1988 earthquake in Armenia, Hurricane Hugo and the Loma Prieta earthquake in 1989, the cyclone in Bangladesh in 1991, Hurricanes Andrew and Iniki in 1992, and the Northridge and Kobe earthquakes of 1994 and 1995.

Interest in the study of risks, hazards, and disasters has grown in the field of sociology since Short's address.[3] Recent research (e.g., Heimer, 1988; Krimsky and Golding, 1992; Clarke and Short, 1993; Dietz *et al.*, 1999) has raised complex issues regarding the study of risk. However, the field has yet to develop a coherent theoretical perspective from which to study hazards. European social theorists, notably Niklas Luhmann (1993) and Ulrich Beck (1992; 1995; see also Beck *et al.*, 1994) have been trying to move in that direction. However, because their texts are highly abstract and generally unconnected to data, they are likely to frustrate more empirically oriented social scientists and researchers who are trying to make sense out of concrete cases and patterns of loss and vulnerability. Moreover, since their analyses deal almost exclusively with risks associated with technology in contemporary industrialized (or rather, "postindustrial") societies, their work does not address the range of disasters and risks that societies encounter. Beck's formulations in particular say almost nothing about natural hazards, which is troubling to those of us who see natural and technological disasters as having common sources.[4]

I am not going to present a general theory of risk here, either. I will, however, discuss how sociology can best approach the study of hazard-

[3]For example, sessions on the sociology of risk appear regularly at annual American Sociological Association meetings, and sessions on disaster research are now more common at both national and regional conventions. Efforts to form a Research Committee on Disasters within the International Sociological Association had already begun prior to 1984; the Research Committee was officially recognized in 1982, and its journal, the *International Journal of Mass Emergencies and Disasters*, began publication in 1983.

[4]Beck states, for example (1995:20), that "[h]umanities' dramas—plagues, famines, and natural disasters, the looming power of gods and demons—may or may not quantitatively equal the destructive potential of modern mega-technologies. They differ essentially from 'risks' in my sense since they are *not the result of decisions* [emphasis in the original], or more precisely, of decisions that focus on techno-economic advantages and opportunities and accept threats as simply the dark side of progress." One point I make here is that so-called natural disasters are as much the result of decisions as those associated with technology.

related phenomena and why the field needs to develop a more critical theoretical perspective that recognizes the roles of power, institutionalized interests, organizations, and the state in the social construction, creation, and allocation of risk. After a brief overview of the field of risk assessment, this paper makes a series of recommendations for how the field should conceptualize and study hazards. The issues and examples discussed intentionally include both natural and technological disasters and different societal settings to show the importance of developing a comprehensive framework for understanding hazards.

## CURRENT EMPHASES IN THE RISK ASSESSMENT FIELD

For discussion purposes, risk will be conceptualized broadly, as "the potential for realization of unwanted, negative consequences of an event" (Rowe, 1977:24). The fields of risk assessment and risk analysis are aimed at identifying, measuring, characterizing, and evaluating the outcomes resulting from natural and technological hazards (Lowrance, 1976; Crouch and Wilson, 1982; Lave, 1982; Mitchell, 1990; National Research Council, 1996). In the United States, pressure to develop a systematic approach to the study of risk originated from a number of societal sources, including the need for standards of safety in the regulation of new technologies and products (Mitchell, 1990); increased public concern with risky technologies (Dunlap *et al.*, 1993); growing public skepticism about the regulatory process (Lipset and Schneider, 1983); legislation requiring social and environmental impact assessments; and the insurance industry's need for accurate data on which to base premiums (Heimer, 1985; Abraham, 1986).

Risk research encompasses a range of topics and studies that estimate both the probability of events and their likely effects, including mortality, morbidity, and economic losses (cf. Petak and Atkisson, 1982; National Research Council, 1993, 1996). Much of the literature focuses on the analysis of the risks associated with natural hazards and disasters, but a great deal of work and a great deal of controversy centers on the assessment of technological risks (for recent overviews, see Royal Society Study Group, 1992, and National Research Council, 1996; for an brief history and discussion of key institutions, organizations, and patterns of funding in the risk research field, see Golding, 1992).

To date, other social science perspectives have influenced the practice and products of risk assessment more than sociology has (Dietz *et al.*, 1999). Geographer Gilbert White, who began studying hazards over four decades ago, directed a comprehensive review of research on natural hazards and

founded the Natural Hazards Research and Applications Information Center at the University of Colorado in the 1970s. Geographers have also been heavily involved in risk-related research at the Center for Environment, Technology, and Development at Clark University. In the geographic research tradition, the emphasis has been on documenting hazard probabilities and impacts, both nationally and cross-nationally (see, for example, Kates, 1971; White, 1974; Burton *et al.*, 1978; Kates *et al.*, 1985; Kasperson *et al.*, 1988).

Anthropology has contributed to risk discourse by analyzing how culture and ideology shape societal definitions of danger. Douglas and Wildavsky (1982), for example, describe views on risk not as reflections of objective reality, but rather as cultural phenomena that reflect societal and group values and that must be interpreted in light of their broader cultural functions. Kirby (1990:282) argues that "the individual's perception of risk is usually dependent upon a social representation, which can be defined as a culturally conditioned way of viewing the world and the events that take place there." Raynor and Cantor posit a "cultural model of institutional risk behavior" (1987:8) in which organizational interests shape risk estimates and give rise to conflicts among the various constituencies concerned with risk management.

The fields of psychology and social psychology have dominated risk research in the social sciences. These areas focus on how individuals perceive various risks, what factors enter into the estimation of risk, and how people make risk-related choices. Central to the psychometric paradigm is the notion that most people have difficulty understanding risk information and for various reasons are not able to develop accurate risk estimates. Consequently, much of this work has focused on how individual perceptions of actual or objective levels of risk are distorted. In explaining these distortions, particular emphasis is placed on the nature of human cognitive processes and on the manner in which the framing of risk estimates influences laypersons' responses to risk information. Studies seek to uncover the "heuristics," or cognitive shortcuts that shape risk perception; the attributes of risky events that tend to lead to misestimation (e.g., their perceived dreadfulness and irreversibility), the ways in which people's perceptions of hazards shift, depending on how risk probabilities are stated; and the ways in which the risk perceptions of laypersons differ from the estimates offered by experts and from objective, empirical data (Tversky and Kahneman, 1973, 1981; Slovic *et al.*, 1977; Fischhoff *et al.*, 1981; Kahneman *et al.*, 1982, Covello, 1983; Fischhoff, 1990). The net effect of this line of research has been to make individual and group perceptions a central consideration in the study of risk in the social sciences, to the neglect of other topics.

## AN ALTERNATIVE PERSPECTIVE ON RISK

A growing body of work in sociology suggests an alternative framework for conducting research on risk. In this section, I make a series of arguments for how sociology should proceed in order to develop a more critical perspective on risk and risk-related phenomena. These arguments focus on the need for analyzing the social construction of risks and hazards, the organizational and institutional factors that influence risk estimates, the framing of views people hold on hazards, and the social production and allocation of risk.

### Treat Risk as a Social Construct

Sociology has an important role to play in challenging claims about objectivity in the science of risk assessment. With a few exceptions, risk analyses outside the social sciences generally consider the probabilities associated with the occurrence of particular events as objective, knowable, and quantifiable; risk analysis is seen as a method for developing estimates that approximate reality. Many risk calculations, such as those associated with traffic- and fire-related deaths, are based on extensive actuarial records. That risks like these are comparatively well understood creates a spillover effect that legitimizes risk-analytic procedures in general; meanwhile, analysis continues in other areas where data are scarce or virtually absent. In engineering research, for example, risks are modeled for phenomena such as nuclear power plant failures on which empirical data are lacking. Estimation problems are solved through the application of specialized methodologies such as fault-tree analysis. When data are insufficient, uncertainty is routinely handled through panels of knowledgeable individuals who are asked to assign probabilities to various outcomes based on their past research, experience, or "engineering judgment."

Because they involve equations and computer modeling, risk analyses appear as if they are based on extensive empirical data. However, this is quite often not the case. For example, lack of data has not prevented analysts from constructing loss estimates for catastrophic natural disasters that have no historic parallel, such as a recurrence of the New Madrid earthquake sequence of 1811 and 1812 in the Central United States, the occurrence of a 7.0 earthquake on the Newport-Inglewood Fault in West Los Angeles, or a comparable event on the Elysian Park Fault System near downtown Los Angeles. A specialized subdiscipline has developed to deal with "low-probability, high-consequence" events, i.e., catastrophic events with very low historic rates of occurrence, for which risk estimates are

nonetheless considered crucial (cf. Waller and Covello, 1984; Kunreuther, 1992).

Regardless of their empirical soundness, risk estimates, once derived, tend to be viewed as accurate reflections of the world "out there." Many social scientists have accepted this realist model of risk analysis quite uncritically (Perrow, 1984). In the risk perception subfield, for example, studies have focused on understanding the magnitude and origin of the discrepancies that are observed between actual and perceived risk; in addition, researchers have struggled to develop risk communication strategies that would bring laypersons' presumably distorted views more into line with calculations of "objective" risk (cf. Covello *et al.*, 1987; Covello *et al.*, 1988).

However, recognition has grown that "[t]o assume that objects are simply waiting in the world to be perceived or defined as risky is fundamentally unsociological" (Hilgartner, 1992:41), and sociologists are increasingly viewing both risk and risk estimates as socially constructed. A social constructionist approach does not claim that harm does not exist. Rather, it assumes that "the basic sociological task is to explain how social agents create and use boundaries to demarcate that which is dangerous" (Clarke and Short, 1993:379).

Work on the social construction of risk focuses on two general topics. The first involves the social and cultural factors that influence the selection of what Hilgartner (1992) calls "risk objects," a term encompassing event probabilities, event characteristics, resulting impacts and losses, and the putative sources of those events and losses. Johnson and Covello (1987), for example, examine how various societal actors, including emergent groups, social movements, business enterprises, government agencies, and professions, shape both the characterization of risk and the selection of risk management strategies. Similarly, Dietz *et al.* (1989) show that alternative ways of framing risk-related controversies—for example, as resulting from differences in parties' access to scientific knowledge, or from vested interests, or from value differences—are rooted in intergroup struggles to legitimate the resources they control.

In the natural hazards area, Robert Stallings (1995) demonstrates how the earthquake threat is socially constructed, the product of promotion and claims making by a group he terms the "earthquake establishment," consisting primarily of engineers, scientists, and representatives of federal agencies. Stallings is not, of course, suggesting that earthquakes do not occur, or that they do not do damage. Rather, his study documents the ways in which organized social actors frame the earthquake problem as a putative threat to the social and economic order, as well as the social

processes involved in the formulation of programs that are then defined as solutions to the problem. Most importantly, Stallings shows how the interests of the earthquake establishment itself, which is dominated by engineers, geologists, seismologists, and federal entities like the U.S. Geological Survey, are critical in shaping the policy initiatives developed to deal with earthquakes.

A second, related line of research focuses on the social construction of formal risk analyses. Sociologists have long been interested in the manner in which factors such as the organization of scientific work and interaction among scientists influence the process of scientific discovery (cf Mulkay, 1979; Knorr-Cetina, 1981; Pinch and Bijker, 1984; Lynch, 1985; Pickering, 1992). One consequence of these constructivist studies of science is to view scientific facts as "outcomes which are inseparable from the courses of scientific inquiry which produce them" (Lynch, 1985:4). The understanding of scientific work that has emerged from this program of research is at variance with the received image of science as rational, universalistic, and capable of discovering objective truth, an image that is the foundation of the field of risk assessment (Wynne, 1982).

Sociologists need to do more research on risk analysis as a scientific enterprise by examining critically the social processes and institutional constraints that influence the manner in which analyses are carried out (Dietz, *et al.*, 1999). To date, such work has generally focused on the estimation of risks associated with technology. Perrow (1984) and Shrader-Frechette (1985), for example, describe how nuclear power risk assessments were influenced by organizational considerations, resulting in the exclusion of many potential causes of system failure. Shrader-Frechette has also documented the extent to which studies on the risks of high-level nuclear waste disposal were influenced throughout their course by what she terms "problematic inferences," errors in reasoning that call into question existing assessments of the safety of such facilities (1993; see especially chapter 6). Rather than being objective and value neutral, the entire risk assessment process has been influenced by value choices. Indeed, she argues that "[o]ne of the greatest abuses of quantitative risk assessment (QRA) has been to cloak the value judgments of QRA behind a veneer of technical precision" (1993:7).

The constructed nature of risk estimates is perhaps most evident for technologies such as genetic engineering that lack extensive performance records and whose with potential effects are poorly understood (Perrow, 1984), and for activities like the long-term underground disposal of nuclear waste that have yet to take place. However, even in a relatively well-studied area like airline safety, it is clear that analyses involve not only data but

also organizational decisions that define some threats as important and rule others out.[5]

Some sociologists find social constructivism troubling but still recognize its contribution to the study of risk. In a recent series of papers that consider the realist/constructivist debate, Eugene Rosa (1993, 1995, 1998) acknowledges both the ontological reality of risk and the socially-constructed nature of many risk estimates. Rosa argues that while there are indeed risks "out there" in the world (which no reasonable person can possibly deny), knowledge about risks exists on a continuum ranging from the well understood, empirically grounded, and quantifiable to the constructed. It is, of course, correct to point out that analysts are able speak with more confidence about certain types of risk-related phenomena than others, in part because some risks lend themselves better to empirical study than others.[6] While the ontological and epistemological questions he discusses are important, more central to sociology's concerns are other issues, such as the processes that are involved in the social production of knowledge about risks, processes that are influenced by money, power, and institutional interests. That the risks associated with asbestos exposure are real and can theoretically be measured is less important sociologically than what asbestos manufacturers did for decades to keep the public ignorant about those risks.

## Seek to Better Understand and Explain the Structural Factors and Institutional Interests That Influence Risk Estimation Practices

The argument that risk estimates are social constructs leads logically to the question of why particular risk estimates are selected and legitimated, rather than others (Reiss, 1992). More research is needed on how risk calculations are constructed and on the processes through which some

[5]Writing about the 1989 Sioux City, Iowa, airline crash, for example, Charles and Settle (1991:79) note that the total hydraulic failure that caused the crash was deemed by the manufacturer and the airline as so unlikely that "pilots are neither specifically trained to respond to such a catastrophe, nor are flight manuals written with instructions on how the flight crew is to proceed under such circumstances."

[6]Rosa characterizes such phenomena as high in ostensibility and repeatability—meaning that they can be measured with relative ease and that they occur regularly enough to build up an empirical record. However, without digressing, I would argue that while ostensibility and repeatability are partly inherent in hazardous phenomena themselves (only a certain number of great earthquakes have occurred since the invention of the Richter scale, for example), ostensibility in particular is a function of the effort and resources put into measuring hazards and of the social organization of risk assessment itself. We need only to think about how knowledge developed about the risk of contracting AIDS to understand this point. Phenomena that are highly ostensible and repeatable, like the rising of the sun, for example, are outside the realm of risk anyway.

conceptions of risk, rather than others, come to be viewed as valid, and by whom. To address these issues, it is necessary to focus on the political, institutional, and organizational contexts in which positions on risk are developed and promulgated.

Both participants in the risk assessment process and sociologists who study risk suggest that political power, organizational agendas, and economic interests drive the science of risk assessment. For example, Henry Kendall's (1991) account of decades of systematic underestimation of the problems associated with nuclear power discusses in detail how various organizational entities, such as the Atomic Energy Commission, the Joint Committee on Atomic Energy, and the Nuclear Regulatory Commission consistently pushed the idea that nuclear power plants were necessary, safe, and economical, despite mounting evidence to the contrary. Even very early on, studies that could have been detrimental to the nuclear energy program, such as WASH-740, which was commissioned by the Atomic Energy Commission and conducted by Brookhaven National Laboratory, were simply ignored. Over the years, as the program expanded, many critical safety issues were either discounted or left unresolved, and the safety recommendations accepted by expert panels were often implemented in a weaker form.

Russell Peterson, a member of the Kemeny Commission, which investigated the Three Mile Island nuclear power plant incident, made the following observations about how willing the scientists involved were to listen to individuals with differing perspectives, even in the aftermath of the accident (1982:42):

> Why is it that a Ph.D. nuclear physicist who has worked on nuclear energy in a highly creditable way with his colleagues for many years loses his credibility at the moment that he questions the safety of nuclear energy? I tried to arrange for just one such nuclear physicist to work side by side with, or just consult with the nuclear scientists on the Kemeny Commission staff, who as a group had the mindset that nuclear energy is safe. This effort of mine was successfully resisted

Lee Clarke (1985) has also documented the highly activist role played by the federal government in promoting nuclear energy. The government needed to take a strong advocacy position and overcome the utility industry's resistance because nuclear power was closely linked in the plans of policymakers with the military uses of atomic energy.

Clarke (1990) later looked into the role played by key organizational and governmental actors in framing estimates of the risks associated with oil spills. Focusing on the decision to build the trans-Alaska pipeline and to use supertankers like the *Exxon Valdez* to transport that oil, he shows that decisions about large-scale technologies and projects are not driven by scientific considerations regarding risk. Rather, the opposite is the case:

judgments about risk and safety should more appropriately be viewed as the by-products of decisions made on economic and political grounds. Once a decision is made to undertake a project, and to do that project in a particular way, then studies are conducted that show how necessary it is—and how safe it is.

In similar analyses, Vaughan (1989, 1990, 1996) examines how the structure and decision-making processes of NASA and its relationship to regulating agencies contributed to the organizational views on risk that culminated in the *Challenger* accident. Again, her findings show that risk assessments should not be considered as the products of objective, scientific calculation, but rather as the outcomes of organizational decisions. Influencing these decisions is a combination of technical information, organizational agendas and constraints, and role-related pressures. Arguing that risk assessments based only on what is known about the performance of technical systems are inherently invalid because they fail to consider the contribution the organization itself makes to risk, Vaughan concludes that "when technical systems are assigned low, moderate, or high risk potential without considering the organizations that produce and run them, the risk is always greater than we think" (1989:346). Even though organizational factors are increasingly seen as playing a significant role in technological disasters (see, for example, Shrivastava, 1987), risk assessments still tend to ignore these factors (Fischer, 1991).

Along these same lines, the ability to conduct risk assessments that are considered authoritative is monopolized by a small number of organizations and analysts. The risk analysis field, by its very structure and organization, has an especially close affinity with the interests of the federal government and major industries. For example, studies on the U.S. "risk policy system" (Dietz and Rycroft, 1987; Dietz *et al.*, 1999) find that the majority of the professionals in the risk analysis field are employed in a small number of institutional settings. About one-fourth of those professionals work for federal government regulatory agencies. Corporations and industry associations employ the next largest number of professionals, about 18%. The remainder are split among law and consulting firms, environmental organizations, state and local governments, labor organizations, universities, and think tanks. Analysts with the highest levels of expertise and training typically work for government or private industry. Thus, it is relatively easy for organizations to obtain the analyses they need, particularly with the budgets they have at their disposal and the controls they are able to exercise over those who do the actual work. Government and industry have, in effect, cornered the market on risk analysis.

Borrowing from social-psychological research on the role of heuristics

in individual risk perception, Clarke (1993) suggests that organizations also use heuristics when they develop their positions on risk. Contingency plans for disaster events such as major oil spills are based on accident scenarios, which are in turn based on quantitative, "objective" risk analyses. However, in deciding the types of events to model, organizations prefer easy-to-manage scenarios and low risk estimates, which are then used to justify their correspondingly optimistic assessments of their ability to respond.

Observing that "inevitably a field is shaped by those who pay its bills" (1996:76) Baruch Fischhoff, a prominent risk analyst, points to the subtle ways in which the relationship between researcher and sponsor shapes the risk-assessment process (1996:76–77):

> . . .researchers might double-check uncomfortable results more rigorously than desired ones. They might be unwittingly influenced in the assumptions that they make about variables that are not examined in detail. They may learn to explain their work in terms that sponsors can understand, and to create work that sponsors care about hearing. Over time, any imbalance can be corrected, as the research is exposed to various critiques. But that may take a while, especially when research is expensive. . . . [F]irms may reduce their support for university labs that fail to affect their bottom lines. . . Funders can issue requests for proposals and then solicit bids on favored topics. They can set reporting requirements, demand private briefings, and delay publication. . . .

Similarly, Manning (1989:351) argues for a conceptualization of risk analysis based not on the scientific model but rather on the political economy of organizations:

> Ultimately, organizational decisions concerning the existence, level, kind and location of risks and the consequences for target populations are political decisions. The values by which decisions are rationalized, and the grounds presented to publicly account for these decisions, are in the first instance neither 'legal' nor based entirely on scientific reasoning. They do not rest solely on probabilistic calculations of likely outcomes. This is true even if the rendered accounts for the decisions are cast in the language of 'risk analysis'.

The recent National Research Council report on risk (1996) illuminates many facets of the risk characterization and communication process. However, the report assumes that analysis precedes rather than follows organizational decision making, and it neglects to address how risk assessments are actually developed and used. Instead, the report concentrates on how risk-producing organizations should behave with respect to risk controversies, rather than on what they actually do.[7] In practice, the science of risk

[7]The report does, however, acknowledge that its recommendations "call on organizations to do what they do not routinely do: combine analysis with deliberation, broaden the range of outcomes potentially subject to analysis, and broaden participation in activities that were previously restricted to analytic experts and a few decision makers" (1996:133).

analysis is inextricably linked to the interests of powerful organizational and institutional actors. These interests include freedom from external constraints, oversight, and regulation, and the ability to pursue profits and externalize costs. I will return to this point later when I discuss the pivotal role organizations and the state play in producing and allocating risk.

### Treat Risk Perceptions as Dependent Rather Than Independent Variables, and Study How These Perceptions Are Shaped and by Whom

The beliefs people hold about risk are typically used in social science to explain behavioral outcomes, such as the actions people take to protect themselves against hazards. However, such perceptions might more usefully be studied as dependent variables, that is, by focusing on where ideas about risk come from in first place. Carol Heimer (1988), for example, argues that the heuristics and perceptual frames that psychologists study should appropriately be seen as outcomes of the rhetorical strategies that various institutions employ in making claims about risk. The public's judgments about risk and safety do not develop in a vacuum; rather, the public is influenced by organizational strategies that seek to frame risks in ways that benefit corporate and institutional actors. Because power and resources are key determinants of persuasiveness, "some groups, such as federal officials and representatives of business, are more likely to be able to get their cases heard than are others, such as workers and environmentalists" (Heimer, 1988:505). Such analyses also highlight the importance of moving beyond individualistic, psychologistic, and objectivist views of risk and focusing instead on the political functions of risk assessment.[8]

### Critically Analyze the Causes of Major Accidents and Disasters

Nonsocial-scientific assessments invariably portray risk as a property of physical or technical systems and their components; accidents or

[8]The examples discussed thus far involve interests that press to ensure that the risks associated with certain events and activities are underestimated. However, groups may also argue that a risk is unacceptably *high*. For example, the U.S. insurance industry has been developing estimates for losses associated with hypothetical catastrophic disasters. The industry projects huge losses and negative economic consequences on a national level for some of these disaster events, predicting that insurers and reinsurers could stagger under the burden of massive disaster-induced payouts. One goal of this loss-estimation activity is to convince the Congress that a federal insurance program is needed to provide back-up funds for private insurers.

disasters occur because system components fail to perform as they are supposed to. When disasters do occur, the search for their causes is typically not wide-ranging. Proximate conditions are emphasized, and generally two categories of causes are favored: physical/technical system failures and "human error." Explanations are sought in the design details of system components, the immediate circumstances surrounding an accident, and individual decision making at the time an incident occurs. Thus, analyses of the *Challenger* accident focus on "O-rings"; analyses of the collapse of the Cypress structure in the 1989 Loma Prieta earthquake center on the proper engineering specifications for double-decker highways; commentaries on the Exxon *Valdez* oil spill focus on who was on the bridge when the tanker hit Bligh reef, how much the captain drank, and when he drank it; and postaccident reports focus on poorly maintained gauges that malfunction, dials that give the wrong readings, and operators who fail to use good judgment. What are typically *not* discussed are the broader organizational, institutional, and societal factors that contribute to the occurrence of these incidents. There is, in other words, a failure to contextualize, and context is precisely what sociological analysis is able to provide.

Leo Tasca's *The Social Construction of Human Error* (1990) is a good example of the type of work sociologists should be doing to broaden the causal framework used in the analysis of disaster events. Through analyzing investigations on maritime accidents, Tasca shows how accident report findings and conclusions are shaped by legal and institutional pressures, specifically the interests of organizations like the U.S. Coast Guard and the various legal and administrative entities that regulate shipping. He also shows how individualistic assumptions about blame, which are embedded in judgments about human error, serve to divert attention away from the structural sources of marine accidents, such as the production pressures ship owners place on marine workers. (For other discussions on the institutional and economic context affecting maritime safety, see Furger, forthcoming, and Furger and Brulle, 1997.)

The mass media clearly play a key role in framing perceptions about why disasters and accidents occur. In work resembling Joseph Gusfield's (1981) research on the drinking–driving problem, Robert Stallings (1990) analyzes news reporting on a bridge failure to illustrate how the media construct the causes of accidents. The causal factors selected for emphasis are related in part to the kinds of sources news reporters typically use; reliance on particular sources is related in turn to journalists' knowledge of which organizations have been linked in one way or another to the problem. Monocausal explanations, particularly those emphasizing individuals' actions, are favored over multicausal ones.

Earlier I argued that risk perceptions should be viewed as outcomes of organizational efforts to present risks in particular ways. It is impossible to address issues of this kind without taking into account how the media frame hazards. The substantial literature on this topic (for example, see Mazur, 1981; Wilkins, 1986, 1989; Gamson and Modigliani, 1989; Walters *et al.*, 1989; Mazur and Lee, 1993) provides many insights on how particular models of causation come to be embedded in organizational and public discourse about risk and more generally on how media coverage and content affect the public perception of hazards.

## Recognize That Risk Is Dynamic

A sociological perspective on risk also challenges the essentially static, closed-system approaches that analysts employ in formulating risk estimates. Risk analysis is based on the assumption that data from past accidents and disasters can be used to project future risks. This runs counter to what sociologists have long known about risks and hazards, which is that human activity and social change continually modify societal, community, and individual vulnerability levels. This principle holds for all types of hazards, from recurrent and well-understood natural phenomena to rare and exotic technological agents. Risk levels are continually in flux because risk is a product of how social actors behave. Since this is the case, past experience is not a reliable predictor of future losses.

The risks associated with social and physical systems are not inherent in those systems, nor are they fixed; rather, they are the outcome of interactions among those social and physical units, social structure, and human (usually organizational) decisions. At the simplest level, physical systems become more prone to failure as they age, and maintenance practices, the value placed on safety, and other organizational and cultural factors also influence their failure probabilities. Formerly safe systems can gradually undergo an "atrophy of vigilance" as organizations decide things are going well enough that can start to deemphasize safety, which leads in turn to more accidents (Freudenburg, 1992). More broadly, social change continually modifies risk and vulnerability. For example, the failure of the savings and loan system, one of the most catastrophic economic "accidents" in U.S. history, was the result of incremental shifts in the regulatory environment in which thrift institutions operated that over time undermined their solvency. At the beginning of the 1980s, few people would have viewed the decision to place money in a savings account as risky. Based on decades

of experience, S&L institutions were widely understood to be safe, yet risks were increasing steadily.

In the aftermath of Hurricane Andrew and the 1994 Northridge earthquake, a number of insurance companies failed, and many major carriers chose to leave the Florida and California insurance markets entirely rather than risk future disaster-related losses.[9] Despite its extensive underwriting experience, the industry had misestimated its own exposure to major hazards, in part because it failed to appreciate the extent to which demographic and social change had placed so much more property at risk. Insurance companies are commonly perceived as experts in risk calculation, but the industry, which made decisions on past experience, was blind to how its own disaster loss potential had ballooned.

Diane Vaughan's research on the *Challenger* accident illustrates this dynamic property of risk and shows that uncovering the causes of catastrophic failures requires an understanding of how risks are regulated and levels of safety are achieved in an interorganizational context. The shuttle accident had its roots in the position of autonomy NASA had achieved within the network of safety units charged with its regulation and in the symbiotic interdependence that existed between NASA and its regulators. At the time of the accident, the units responsible for reducing risks were in fact dependent on NASA and were virtually powerless to effectively impose sanctions to increase safety. Failures in sociotechnical systems originate in a dynamic multiorganizational and institutional environment that conventional risk analysis fails to take into account.

That data on past events are in some instances reasonably good predictors of future failures and losses does not in and of itself lend credence to risk-analytic projections, even when those data are abundant. Such an assumption would only be valid if one were to also assume that the social, behavioral, cultural, economic, and political contexts in which risk-related activities are carried out remain static, or that those contexts have no implications for safety.

[9]Since 1984, companies wishing to sell any homeowners' insurance in California were required to also offer earthquake policies. This was not a problem for the industry, because earthquake insurance was profitable. However, after the 1994 Northridge earthquake, which caused insured losses of $12–13 billion, many of the country's largest companies decided to stop writing policies in California to contain future earthquake-related losses. In 1996, the state set up its own insurance entity, the California Earthquake Authority, to offer property owners some protection against losses. Private insurers participate in the Authority, but their exposure is lower than it would be otherwise (*Los Angeles Times*, December 3, 1996).

## Conduct Research on the Social Allocation and Production of Risk

### *Imposed Risk and Social Inequality*

Much of the literature on risk likewise downplays two important issues that should be major foci for sociologists: the imposition of risk and the unequal consequences hazards have for different segments of society. The literature tends to depict people as assuming risks, either because they want the benefits that accrue from risky behavior or because they have a poor understanding of the hazards they face. However, a more sociological approach would explore the processes through which risks are imposed on people, either because they lack access to information about risks, or because their choices are socially structured. Clarke (1985, 1988, 1989), for example, points out that while members of the public are typically characterized as making choices about risk, organizations are actually far more important decision makers in matters involving risk. Many (if not most) decisions about acceptable levels of risk are made by organizations and governments, not members of the general public, who may, in fact, know little about the risks they face. For example, facilities that produce, transport, and store very hazardous materials obviously pose some risk to nearby community residents. However, prior to the passage of the Superfund Amendments and Reauthorization Act (SARA) of 1986, there was no legal requirement that chemical companies disclose to community residents any information whatsoever about the kinds of hazardous chemicals processed and stored at facilities. In what sense, then, did residents "assume" whatever risks they faced? When a chronic toxic hazard like Love Canal is discovered, property values typically drop precipitously, making it difficult for people who have invested their savings in homes to escape from hazardous areas. If they remain, should we conclude they have voluntarily assumed the risk?

Although technological hazards are the most obvious examples, risks in the natural hazards area are also largely imposed, rather than assumed. For example, although the need for enhancing levels of earthquake safety is increasingly emphasized in the U.S., the kinds of measures most likely to be effective in reducing earthquake losses generally cannot be undertaken by the average building tenant or worker, but rather must be performed by a property owner or employer.[10] Since hazard reduction decisions

[10]Earthquake awareness, education, and preparedness are often emphasized as desirable public policy goals. Not coincidentally, they are also relatively inexpensive. More potentially effective measures are much more controversial, not only because they cost more, but also because of who would have to pay for them—i.e., important organizational and institutional actors. These measures include making appropriate decisions about land use and the siting of structures away from seismic hazard areas, employing appropriate seismic design and con-

are made on economic grounds, and since real hazard reduction costs money, owners resist taking the necessary steps [11] As a consequence, many people in areas of seismic risk involuntarily live and work in structures that are potentially hazardous in an earthquake situation. This occurs not because they have chosen to assume a risk, but rather because that choice has been made for them.

Low levels of seismic safety exist because they contain costs and protect profits. Pro-development interest groups, landlords' associations, and the real estate lobby are among the groups that consistently oppose earthquake hazard mitigation measures when they are proposed and that try to weaken such measures when they are adopted (Olson, 1985, Alesch and Petak, 1986). Meanwhile, many of the individuals who live and work in hazardous locations may actually be unaware of the hazards they will face if an earthquake occurs.[12] Similar patterns of opposition by development interests have been observed for other natural hazards (cf. Burby and French, 1981; Godschalk *et al.*, 1989). The typical strategy is to fight regulatory legislation when it is proposed, stretch out the timetables for implementation of laws that pass, and weaken enforcement.

The earthquake example illustrates another sociologically relevant point many risk analysts gloss over in their work: that risks are imposed unequally in society, and frequently those most exposed are least able to cope with risk. In general, people who lack economic resource are the most likely to involuntarily face hazards and have the most difficulty recovering when disasters occur. Looking again at the earthquake problem, the old masonry buildings in California that present the greatest collapse hazard in the event of an earthquake also constitute a major rental housing source for low-income residents. In the 1989 Loma Prieta earthquake, the cities of San Francisco and Oakland both lost a significant proportion of their low-

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struction practices; relocating structures, facilities, and activities when seismic hazards become apparent; retrofitting buildings constructed under earlier, less effective building codes; and anchoring wood-frame structures more firmly to their foundations

[11]The term "owners" does not refer only to private entities. Major property owners in California that have historically been reluctant to take actions to enhance the seismic resistance of the buildings they own include the University of California, the State of California itself, and the federal government. The situation has improved marginally as a result of recent earthquakes, but change is occurring very slowly

[12]Although the earthquake hazard is more widely recognized in California, other parts of the U.S., including the New Madrid Fault Zone in the Central U.S., the Puget Sound area, and parts of Utah, South Carolina, and New England are also subject to the earthquake threat When attempts have been made to put the earthquake problem on the political agenda outside California, organized opposition to upgrading building codes and improving construction practices has typically been swift and effective. The political economy works to discourage seismic upgrading throughout the country

income housing units due to earthquake damage; single-room-occupancy (SRO) hotels and homeless shelters were particularly hard hit by that event.[11]

A look at toxic hazards also reveals how vulnerability is structured by race, ethnicity, and political and economic power (General Accounting Office, 1983; Couch and Kroll-Smith, 1985; Commission for Racial Justice, 1987). The need for tax revenues and jobs leads communities in less well-off areas like the South to compete in order to attract economic activity that yields the potential for acute and chronic technological hazards. Southern states with ailing economies have become depositories for hazardous wastes from more affluent regions of the country; of the five states that were leaders in attracting polluting industries during the 1970s, four were in the south (Bullard, 1990). Within those states, poor, minority, and less politically organized communities end up as the "hosts" for such facilities. Even when income is held constant, communities with large minority populations are more likely to be exposed to toxic hazards and noxious facilities, and government agencies also act more slowly and spend less to ameliorate toxic hazards affecting those communities (Bullard, 1994).

Much of the environmental racism literature has been criticized on the grounds that correlation does not imply causality, and some studies find no significant linkage between toxic exposure and race (Anderton *et al.*, 1994; 1997). Other recent research suggests that there is indeed a link, but that the relationship is complex, and that working class communities, rather than the very poor or the well-off, are most at risk (Been and Gupta, 1997). A slightly different approach, put forth by Krieg (1998), argues for a "political economy of place" in which environmental hazards result from communities' dependence on low-wage, polluting industries. This pattern is often, but not always, associated with the presence of racial minorities.

[11]Following that earthquake, the Federal Emergency Management Agency (FEMA) was severely criticized for disaster assistance policies that unfairly discriminated against low-income households, members of the homeless population, and people in transient living situations (General Accounting Office, 1991). A class-action lawsuit filed against FEMA in 1989 resulted in an out-of-court settlement earmarking FEMA funds specifically for the reconstruction of housing for low-income tenants

This case illustrates another flaw inherent in risk assessment and loss estimation studies From a purely quantitative loss estimation perspective, the destruction of a $1 2 million dollar structure in the Marina district of San Francisco that was home to two families prior to the earthquake would be considered equivalent to the loss of a $1 2 million dollar structure in the Tenderloin district that was home to ten families. Marina tenants could have purchased earthquake insurance and would be able qualify for disaster loans, which would speed their recovery. The tenants in the Tenderloin would have no insurance would likely not be eligible for loans Quantitative loss estimation techniques systematically downplay the losses experienced by the poor, which proportionately are significantly greater than those the rich experience

In many instances, toxic exposures proliferate in low-income and minority communities because residents cannot keep them out. Middle-class white homeowners have a long history of organizing politically to fight against threats to property values and LULUs (locally unwanted land uses). Since they have more political clout than less well-off and minority residents, they are more likely to prevail in conflicts over land use. Groups that lack political influence are less able to resist encroachment by LULUs and less able to get chronic environmental problems addressed in their communities. Minority and low-income residents may be more willing to tolerate the presence of noxious facilities if they provide jobs.

Environmental activism had been largely a white, middle class phenomenon (Morrison and Dunlap, 1986) prior to the emergence of the environmental justice movement. Some past studies have suggested that whites worry more about environmental issues than blacks, but later research (Mohai, 1990) argued that African Americans are as concerned about the environment as whites, but are less likely to become actively involved in environmental movements. Reasons may include that those movements tend to be dominated by whites or that blacks decide to put their energies into other issues they define as more pressing. During the last decade minority communities have begun to mobilize to press for the remediation of imposed environmental hazards (Bullard, 1990, 1994). The social construction of an environmental justice frame (Capek, 1993) that places those risks in a broader sociopolitical context and defines protection from toxic substances and facilities as a right has been a key element in that mobilization (for discussions of unequally imposed risks and the environmental justice movement, see also Rosen, 1994, and Krieg, 1995).

### *Organizations, the State, and the Production of Risk*

A key feature of the U.S. and other industrialized societies is the extent to which all aspects of life are shaped by organizations, particularly large ones (Perrow, 1991). This dominance is reflected not only in the magnitude of the risks societies face, but also in their distribution and in the ways they are perceived and managed. Organizations are important actors shaping state policies and practices related to their interests (cf. Laumann and Knoke, 1987), including decisions on hazard management and acceptable risk. It is impossible to overstate the importance of focusing on organizations in order to understand risk (Clarke and Short, 1993), but most research, particularly work within the psychometric paradigm, misses this point entirely.

The field of risk assessment itself is dominated by large public and

private organizations, and organizational dynamics influence the conduct and products of risk research. Information on hazards is disseminated to the public and framed by organizations, particularly large media entities, whose approaches to presenting material on risk are influenced overwhelmingly by the very kinds of organizations responsible for producing hazards in the first place. People's perceptions on risk are shaped by the ways in which risk-related information is communicated to them by these sources. Moreover, those perceptions are also influenced significantly by the trust people have in organizations, including the producers of hazards, the organizations providing risk information, and the organizations responsible for protecting the public (Freudenburg, 1993).

The role of the state in the creation and distribution of risks also needs to be given much greater emphasis. Government is commonly seen as a key actor in the reduction of hazards and losses. However, a closer look reveals very different patterns of state activity: as a passive bystander or outright facilitator of risky organizational and institutional practices; and as an autonomous actor pursuing its own interests and creating hazards in the process.

The state's involvement in producing risks is tied to its role in reproducing the political economy, which rests in turn on promoting conditions favorable to economic expansion and a positive business climate (Block, 1987). Governments at all levels seek to foster growth, even if that growth is accompanied by higher levels of risk. Similarly, regulations that might reduce risks find few governmental champions if those regulations run counter to powerful economic interests. In the natural hazards area, for example, permissive coastal zone development and floodplain management policies, driven by what Molotch and Logan (1984:484) term the "ideology of land-use intensification and local growth," are major contributors to ever-escalating hurricane and flood losses in the U.S. As I discussed earlier, the government's halfhearted approach to dealing with problems of earthquake vulnerability is related in part to political pressure from landlords, developers, and business and real estate interests.

Hazard production also goes hand-in-hand with state efforts to project military power. Returning to the examples I discussed earlier, the U.S. government was initially the main promoter of nuclear power, largely because of its tie in to military priorities. Nuclear reactors had to be built, and as part of that process they had to be defined as safe. Similarly, because of military and national security concerns and pressure from oil companies, the Alaska oil pipeline had to be built, and both the pipeline and oil shipping in Prince William Sound had to be defined as safe (Gramling and Freudenburg, 1992, Clarke, 1990). Oil exploration and drilling and their accompanying hazards are directly related to governmental interest in the

military uses of oil and to its enormous value as a source of revenue (Freudenburg and Gramling, 1994).[14]

The state's role in the creation of risk is equally evident when viewed cross-nationally. State-driven urbanization and development programs were important determinants of the losses that occurred in the catastrophic 1976 earthquake in Tangshan, China, in which 250,000 died, as well as in the 1988 Armenian earthquake. Governmental pursuit of growth and indifference to hazards set the stage for the 1984 Bhopal disaster (Shrivastava, 1987, 1994). Conditions like those that gave rise to Bhopal are increasingly common as "developing" nations join the capitalist world system: lax or nonexistent land-use regulation, the proliferation of squatter camps in hazardous areas, environmental degradation, insufficient infrastructure to support the population and provide protection should a disaster occur, and governments that are only too willing to allow risks to be imposed on the poor for the benefit of elites (Tinker, 1984; Parker, 1992). Trends such as the globalization of capital and growing competition among nations (including the new "market economies" in the former Soviet bloc and China) bring in their wake both burgeoning environmental problems and increases in disaster severity.[15]

State structure and activity have received surprisingly little attention in the literature on risk. Exceptions include work by Schnaiberg (1980), Buttel (1985), and Yeager (1987), which analyze state actions with respect to environmental protection, or rather, the lack of it. Only a handful of studies have attempted to address the impact cross-national differences may have on hazard production and management. For example, Brickman *et al.* (1985) have studied the politics of controlling chemical hazards in the U.S., Great Britain, France, and Germany, and Jasper (1990) has analyzed nuclear energy policy in the U.S., Sweden, and France. Also relevant are studies that focus on how differences in state systems either encourage or discourage citizen mobilization around hazard-related issues (cf. Kriesi *et al.*, 1995).

[14]The nation currently faces a legacy of war-related hazard production, which includes among other things 30,000 tons of chemical weapons in eight Army facilities around the country that are now being disposed of. Risk assessments for those sites show that the weapons can be safely incinerated on site; in fact, disposal has been determined "scientifically" to be one hundred times safer than continued storage of the deadly materials. However, the first incinerator that went on line, in Tooele, Utah, experienced two shutdowns for accidents in its first six weeks of operation. Thirty thousand weapons are scheduled to be disposed of at Tooele alone (*New York Times*, September 1 and October 6, 1996).

[15]Charles Perrow singles out the market economies of China and Southeast Asia as particularly problematic, since "[t]here are no signs of long environmental horizons there on the part of organizational entrepreneurs; and there is no effective state organization to slow down the destruction" (1997:68).

## CONCLUDING COMMENTS

My main point is that the field needs a critical perspective on risk that focuses on the ways in which risk and power are related. Such an approach would recognize that political and economic power determine the ability to impose risks on others, shape public discourse about risks, sponsor and conduct research that presents risks in particular ways, and lobby for particular positions on the acceptability of risk. This approach would build upon recent work that sees vulnerability to both natural and technological disasters as rooted in the operation of the political economy and in social inequality (Blaikie *et al.*, 1994; Schnaiberg and Gould, 1994, Frey, 1995).

While some sociologists may still want to argue that risks are concrete and measurable, and that risk estimates merely need to be further refined so that they more closely mirror reality, more relevant to the field is the study of processes through which risk-related phenomena are socially defined: how and why risks come to be seen as large or small, acceptable or unacceptable; how the causes of risky activity, accidents, and disasters are constructed; how policies to control or remedy hazards are developed; and why some groups, organizations, and institutions have a much greater ability than others to shape risk assessment and management practices.

Similarly, while other disciplines may merely assume that "risk happens," sociologists know better than that. Earthquakes are acts of nature, but earthquake disasters—the deaths, injuries, economic losses, and social disruption that result when the earth trembles—are social in origin. Vulnerability to hazards, whether natural or technological, is not an accident of fate any more than vulnerability to crime or early death. What the field needs is research that places risk creation, risk allocation, and the production of knowledge about risks in a broader political-economic context. Such research would recognize the role played by large organizations, pressure for economic growth, the struggle for profits and political dominance, the globalization of capital, and state activity in both determining levels of safety and risk and shaping our understanding of what those risks are.

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