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ANTHROPOLOGICAL RESEARCH ON HAZARDS AND DISASTERS

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ABSTRACT

Recent perspectives in anthropological research define a disaster as a process/event involving the combination of a potentially destructive agent(s) from the natural and/or technological environment and a population in a socially and technologically produced condition of vulnerability. From this basic understanding three general topical areas have developed: (*a*) a behavioral and organizational response approach, (*b*) a social change approach, and (*c*) a political economic/environmental approach, focusing on the historical-structural dimensions of vulnerability to hazards, particularly in the developing world. Applied anthropological contributions to disaster management are discussed as well as research on perception and assessment of hazard risk. The article closes with a discussion of potentials in hazard and disaster research for theory building in anthropology, particularly in issues of human-environment relations and sociocultural change.

INTRODUCTION

The increasing frequency and severity of natural and technological disasters particularly, but not exclusively, in the developing world place them in the center of debates on human-environment relations and issues of development and sustainability. Disasters occur at the interface of society, technology, and environment and are fundamentally the outcomes of the interactions of these features. In very graphic ways, disasters signal the failure of a society to adapt successfully to certain features of its natural and socially constructed environment in a sustainable fashion.

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Basically, the increase in number and severity of natural and technological disasters constitutes one of the clearest tests available of the lack of resilience and sustainability of many current human environmental adaptations. Any account of human environmental adaptation in the past or present that fails to consider the interaction of the social, technological, and natural processes of hazards and disasters is far from complete. Although awareness of the centrality of these phenomena in human-environment interaction is now emerging in the social sciences, until quite recently there has been a general failure to consider the interaction of the social, technological, and natural processes that produce hazards and disasters in our accounts of human environmental adaptation. Recent concerns about global warming in producing and intensifying hazards and disasters reflect an enhanced understanding of hazards and disasters as indicators of societal adaptation.

ENVIRONMENT, SOCIETY, AND DISASTER

Since about fifteen years ago, however, a new perspective has emerged that views hazards as basic elements of environments and as constructed features of human systems rather than as extreme and unpredictable events, as they were traditionally perceived. When hazards and disasters are viewed as integral parts of environmental and human systems, they become a formidable test of societal adaptation and sustainability. In effect, if a society cannot withstand without major damage and disruption a predictable feature of its environment, that society has not developed in a sustainable way.

When disaster strikes, whether it is the slow onset of drought, exposure to hidden toxic waste, or the sudden impact of an earthquake or chemical leak, it tends to be a totalizing event or process, affecting eventually most aspects of community life. Indeed, disasters have variously been considered a "natural laboratory" or a *crise revelatrice,* as the fundamental features of society and culture are laid bare in stark relief by the reduction of priorities to basic social, cultural, and material necessities (119). In that sense, then, there is a fundamental congruence between the analytical requirements posed by disaster studies and the distinctive approach of cultural and social anthropology (74, 140). The holistic, developmental, and comparative perspectives of anthropological research placing specifics against larger societal wholes and concerned with issues of social change and evolution are particularly congruent with the totalizing nature of disasters (139).

Anthropological disaster research has taken place predominantly outside the Euro-American context, which has been the site of most disaster research by the other social sciences. The numbers of high-impact technological and natural events are increasing much more rapidly now in the non-Euro-Ameri-

can context, where anthropologists have traditionally worked.[1] In early anthropological writing, hazards were considered fundamentally systemic dimensions of the total environment to which traditional peoples established reasonably effective adaptations, which allowed them to maintain long-term stability and viable lifeways in difficult conditions (140). In general, anthropology has added significant breadth and ethnographic solidity to a field that, until recently, focused almost entirely on immediate responses and organizational adjustments in first-world contexts (17).[2]

MAJOR TRENDS IN ANTHROPOLOGICAL RESEARCH ON DISASTERS

Recent perspectives in anthropological research define a disaster as a process/event involving a combination of a potentially destructive agent(s) from the natural and/or technological environment and a population in a socially and technologically produced condition of environmental vulnerability. The combination of these elements produces damage or loss to the major social organizational elements and physical facilities of a community to the degree that the essential functions of the society are interrupted or destroyed, which results in individual and group stress and social disorganization of varying severity. From this basic understanding, three general perspectives on hazards and disasters have developed in anthropology: (*a*) a behavioral response approach, (*b*) a social change approach, and (*c*) a political economic/environmental approach. However, discussion of these three overarching themes as separate entities is fundamentally artificial in that they address issues that are related causally, developmentally and conceptually.

three perspectives--separated but connected

THE BEHAVIORAL RESPONSE APPROACH

A continuing tradition in disaster research in general and in anthropology specifically has tended to view hazards and disasters as challenges to the structure and organization of society and has focused on the behavior of individuals and groups in the various stages of disaster impact and aftermath. The emergence, adjustments, and interactions of individuals, groups, and organizations to the stress of warning, impact, and immediate aftermath have been the central themes developed by this research.

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[1] Due to space limitations, it is not possible to discuss in depth the research now emerging on hazards and disasters by anthropologists from developing nations particularly, but not exclusively, in Latin America (76, 76a). The literature discussed here is limited to work appearing in English.

[2] More complete discussions of the evolution of disaster research in anthropology are available (91, 95a, 140).

Individual and Organizational Responses to Disaster

Several closely drawn profiles of immediate responses to disaster impact focus on institutional adjustments in religion and ritual, technology, economy, politics, and patterns of cooperation and conflict as they emerged both at impact and in subsequent stages. The responses of organizations in several American disasters have been carefully analyzed (71). As in normal times, differentiating factors such as race, ethnicity, class, age, and gender are key variables in the emergence of patterns of consensus and conflict (6, 7, 17, 48, 59, 76, 85, 87, 92, 94, 113, 116, 131, 151, 156, 160, 162, 164). The factors of race, ethnicity, class, gender, and age are also significant in differentiating impact (2, 6–8, 17, 20, 25, 29, 47, 54, 55, 60, 71, 76, 85, 86, 94, 102, 106, 116, 137, 141, 144, 156, 164. A minimum degree of community integration is seen as a basis for initial steps toward recovery and rebuilding, which suggests that early positive responses to disasters should be based on greater local understanding of social and physical environments for the reduction of both short- and long-term losses (42, 47, 68, 79, 91). The quality of interaction between victims and aid personnel, particularly the appearance of a contentious we-they dichotomy, and the impact of postdisaster aid on the fabric and quality of social relations in the aftermath are recurrent themes (55, 79, 87). Also explored are the potentials in these conflictive relations for mobilization of community resources for improved relief and reconstruction efforts (60, 79, 87, 94). The social responses of vulnerable populations, particularly the elderly (45, 47, 48, 125, 126) and children (42, 73, 131), have also received attention.

Predisaster systems of social relationships associated with specific institutions are explored both for the nature of postdisaster response, interaction, and the distribution of aid and other resources (17). Preexisting morally and religiously sanctioned patterns of social inequality, for example, are held responsible for further discrimination and deprivation in circumstances of famine in India (144). Davis highlighted the importance of the Russian Orthodox Church among the Pacific Eskimos after the 1964 Alaskan earthquake in the adjustment and subsequent reconstruction of five heavily damaged villages (21). Wiedman's analysis of a university in a hurricane disaster shows how educational institutions confront major threats, adapt by immediate organizational responses, and avoid major structural alterations (155). The responses to the so-called social disaster of the Oklahoma City bombing provide insights into developing tensions in value orientations within the medical profession (130). Zaman suggested that a simple behavioral approach to social responses to flood and riverbank erosion in Bangladesh is insufficient because it often ignores broader sociopolitical and historical structural factors that influence the decisions underlying adjustment to natural hazards (50, 51, 162, 163, 165, 166).

The startling increase in number and severity of technological disasters in the past decade has generated several significant anthropological studies of social responses (10, 32, 67–69, 78, 103, 117, 131–133). Recent anthropological research on the Exxon-Valdez oil spill in Alaska was prefaced by Omohundro's analysis of the social impacts of an earlier oil spill (99). Much of Alaskan research explores the impact of the stress of the spill on the social fabric of affected communities. In an examination of social solidarity, conflict, emergent groups, and potential recovery efforts from the spill, Button questioned the sociological assertion that chronic technological disasters inhibit the formation and continuity of emergent groups because they erode social cohesiveness and provoke conflict particularly over interpretations of the event (10). Loughlin's work on representation, interpretation, and activism after the Bhopal, India, pesticide leak also constitutes a major challenge to this perspective (66–68). Furthermore, the emergence of the environmental justice movement has been stimulated in large measure by technological hazard risk and impact (56, 115).

The particular social vulnerability of natural resource–dependent communities has generated an alternative conceptual model called the Natural Resource Community (NRC) (32, 108). Defined as a population living within a bounded area whose primary cultural existence is based on the utilization of renewable natural resources, the viability of NRCs is threatened when there is a disruption of the natural resource base such as contamination after a technological disaster like the oil spill. The NRC model may prove useful for social impact assessment and planning for restoration and recovery programs, especially after technological disasters that impact natural resources. Picou et al (108) questioned the lack of ecological considerations that has characterized the study of technological disasters. Employing the ecological-symbolic approach (58), Picou et al substantiated the unique cultural and economic vulnerability of natural resource communities to resource contamination and the long-term social disruption in NRCs by technological disasters as a consequence of the disruption of the relationship between human communities and their biophysical environments (108).

Relative to issues of differential response, a number of anthropological studies have focused on sociopsychological questions about vulnerability, victimization, and aid in disasters. Dudasik proposed four categories of victims for the 1970 Peruvian earthquake: event victims (direct physical victims), context victims (traumatized by postimpact physical and sociocultural conditions), peripheral victims (nonresidents suffering losses), and entry victims (volunteers and assistance agents, suffering postdisaster physical conditions and psychological stresses) (29). Research in American disasters such as the Whittier Narrows Earthquake and the Baldwin Hills Fire in California found

significant linkages between impact and posttraumatic stress symptoms (71–73). Russell found that PTSD was more prevalent among Natives than non-Natives and females than males and also found significant associations between PTSD and exposure to the Exxon-Valdez oil spill (117). Further research suggests that the impact of the oil spill on the psychosocial environment was as significant as it was on the physical environment (103). A study of the Shetland Island oil spill links control of information flow to increased anxiety and suspicion among victims (12).

The cultural expression of postdisaster sociopsychological stress has also received anthropological attention (103). Examining the association between disaster exposure with both "standard" symptomatology and folk illness categories reveals the popular illness category "ataque de nervios" (nervous attacks) as a significant organizing feature of peoples' responses to the 1985 landslide disaster in Puerto Rico, which highlights the importance of predisaster cultural knowledge for appropriate assistance responses in the aftermath (46). Oliver-Smith noted the differential impact of assistance on individuals and groups after the 1970 Peruvian earthquake, arguing that disaster aid may compound the psychological trauma of the disaster by undermining the autonomy of survivors and potentiating a debilitating dependency syndrome (94). Bode's research after the same earthquake on explanation and meaning formulation explored cultural expressions of grief and mourning and culturally acceptable forms of explanation for the disaster for regaining emotional stability (4, 5).

Culture and Catastrophe

Anthropologists have long explored the construction of cultural meanings and world views and the means and contexts in which such constructions are enacted and concretized. It is frequently in extreme conditions, particularly those characterized by loss and change, that human beings find themselves confronted with difficult existential questions. The responses of disaster-stricken peoples invariably involve the moral and ethical core of the belief system and include a deep delving into concepts of both social and cosmic justice, sin and retribution, causality, the relationship of the secular to the sacred, and the existence and nature of the divine (4, 5, 71, 89).

Relocation or resettlement of disaster-stricken populations is a common strategy pursued by planners in reconstruction efforts. Recent research emphasizes importance of place in the construction of individual and community identities, in the encoding and contextualization of time and history, and in the politics of interpersonal, community, and intercultural relations (1, 43, 90, 94, 164). Such place attachments mean that the loss or removal of a community from its "ground" by disaster may be profoundly traumatic (90).

The search for explanation and meaning for tragic losses and radical change has been a concern of disaster research (5, 71, 94). Following a disaster in Cyprus from which recovery was very slow, important shifts in attitudes and values took place in key institutions such as marriage, in which serious commitment changed to a desperate grasp at security in uncertain conditions (65). Oliver-Smith (94) and Bode (4, 5) documented the shifts in religious belief, symbols, and rituals in the aftermath of the 1970 earthquake in Peru.

The need to grieve and mourn properly is another major theme in cultural anthropological research on disasters. In addition to individual losses, severe disasters often destroy whole communities, which occasions grief for lost homes, social contexts, and culturally significant places and structures. When these elements are destroyed, they must be grieved for in ways similar to bereavement for a loved one (152). The loss of formal public places, informal gathering places, and other physical features symbolic of community identity must be mourned (5, 94). Survivors may place enormous importance on fidelity to cultural tradition as well as on the need to bear witness to suffering and the tragedy as experienced (94). Bode's extraordinary exploration of grief, mourning, and meaning formulation after the 1970 Peruvian earthquake is embedded in analysis of myths and legends as well as the religious symbols and rituals that sustained individual and cultural identity (5). The cultural supports and hindrances for grief and mourning are explored in a variety of disaster and crisis contexts (5, 54, 94, 130).

Finally, meaning construction is problematic for the disaster survivor and the disaster researcher, not only existentially but politically. The multiplicity of meanings generated out of the diverse voices in the rapid sequence of events creates an arena in which interpretation becomes a very contested field. In this arena of contestation, the power of representation is particularly crucial in the politics of defining the occurrence and extent of disaster and aid distribution (3, 118). Determining when a disaster has occurred and how much and for how long aid is necessary are functions of the politics of its representation (11, 31, 67, 69).

Politics and Power

Two related themes characterize much anthropological research on political factors in disasters: (*a*) disaster as both opportunity and cause for local political socialization and mobilization, and (*b*) disaster-caused alterations in relations with the state. For both themes, examining how disasters shape, maintain, destabilize, or destroy both political organizations and relations is central (57). Disasters create contexts in which power relations and arrangements can be more clearly perceived and confronted, which transforms political con-

sciousness, shapes individual actions, and strengthens or dissolves institutional power arrangements (10, 57, 95, 122).

Disasters are seen as contexts for creation of political solidarity, activism, new agendas, and developing new power relations. Robinson et al (113) demonstrated that the 1985 Mexico City earthquakes created the political space for emergent groups to seize major roles in aid and assistance, thereby mobilizing a significant threat to the party in power. The reigning party only recovered its hegemony by appropriating and manipulating aid distribution, particularly of housing, after more than 300,000 people were left homeless by the disaster (113). After the 1989 Loma Prieta earthquake, the local Mexican population in Watsonville, California, learned from relatives or from their own experience of the 1985 Mexico City earthquake about the politics of aid, which enabled them, as it did the Mexican survivors, to focus public and media attention on the issue of affordable housing by invading public land (57). Laird's research on the same disaster probed the ideological implications of challenges to local political hegemony brought about by mobilization of minority groups (59). Both Button (10) and Mason (77) explored the political socialization and subsequent mobilization of individuals, groups, and communities afflicted by the Exxon-Valdez oil spill. The degree to which the groups and organizations formed out of the disaster subsequently broadened their agendas to embrace issues external to the disaster is central to such research (6).

Conversely, disasters may also have inhibiting effects on local political processes. Doughty's long-term research in Peru revealed that disaster impact may combine with major political change to compound the severity of effects on community integration and recovery by subverting "normal" political processes, particularly in the acquisition of aid (24). Davis found that over the long term, the 1964 Alaskan earthquake and subsequent assistance were major factors in increased integration and contact with the state among Native American villages (22). Chairetakis, in her research on development and reconstruction after the 1980 earthquake in Campania and Basilicata in Italy, saw the entire process as reinforcing the political and economic interests of the Christian Democratic party, dominant in southern Italy for the past forty years (17). Johnston & Schulte (57), comparing the sociopolitical dynamics of the Loma Prieta earthquake in California and Hurricane Hugo in the Virgin Islands, found that disasters create opportunities to reorganize power relations. The reconstruction process may become an arena of contestation that can affect predisaster power structures and relations (57, 85–88, 105). Disasters and reconstruction often create opportunities for the entrance of new groups into the political or economic process, which promotes change and evokes or mobilizes resistance in sectors supporting status quo arrangements (17). However, the costs of rebuilding physical infrastructure also constrain opportuni-

ties for empowerment, which in the Virgin Islands, for example, intensified dependency relations (57).

Disasters and Economics

Disasters are often perceived as primarily material events. That is, disasters cause destruction to a physical environment and to the material resources of a society, including the people, occupying that environment. Furthermore, in inflicting damage, disasters create urgent material needs, eliciting flows of material goods and services. When people speak of disasters as "the best of times and the worst of times," they are often referring to the behavior of human beings toward material resources during crisis. In disasters, certain fundamental economic assumptions or questions about human behavior such as altruism, rational choice models (self interest), private property, competition, reciprocity, distribution, contracts, trust, and the tension between social norms and economic self-interest are often highlighted (38). Indeed, many of these issues are central in an Oak Ridge National Laboratory project investigating the social and economic mechanisms needed to reestablish rational market mechanisms of distribution and exchange after a nuclear war or other major societal disaster (13).

In times of material scarcity, particularly those associated with famine, a breakdown may occur in the structure of morality that dictates food and resource distribution (23). Torry maintains that many traditional societies are highly inegalitarian, and crisis subjects certain groups to severe privation or even death. In India, Torry argued, patterns of structured inequality based on religiously sanctioned differentiation (castes primarily), which in normal circumstances produce marked inequalities in resource access, result in times of crisis in a morally justified inequitable distribution of relief (144).

In technological disasters the question of the morality of access to resources often is raised in regard to employment related to the disaster. Sharply divided moral and ethical stands were maintained concerning acceptance of employment and the extremely high wages Exxon was offering for the oil spill cleanup (10). Some research suggests that the morality of resource allocation changes with the stages of the disaster. In the immediate aftermath of the 1970 Peruvian earthquake, class and ethnic lines blurred. Concepts of private property disappeared as owners of animals donated them to the common good. However, over time, the solidarity became strained and conflicts broke out over the use of private resources for the public good. When aid arrived, old schisms reemerged and differential access to resources was not only sanctioned, it was demanded (87, 94). Disasters create a highly charged environment in which the moral order of society and individual rational choice or self interest are both thrown into high relief and potential contradiction.

The convergence of people of all sorts, from emergency workers to the merely curious, on the disaster site is well documented. An equally well-documented economic phenomenon is the convergence of material aid. Improved communications technologies alert the world community much more rapidly and graphically than ever before. Modern air transport can put a major relief effort in place in a very few days and maintain a virtual air bridge of continual supplies for extended periods of time (44). In effect, a disaster can almost overnight turn a region characterized by customary scarcity into a "disaster boom economy" (30). Relief agencies enter the disaster zone not only with material goods, but more significantly, often with employment, which creates high-paying jobs (10, 103). Postdisaster aid after the 1970 Peruvian earthquake produced a number of economic effects, including a new population of relatively prosperous consumers (disaster relief and reconstruction personnel), new consumer goods, new forms of housing, new urban design, all of which generally overwhelmed local capacities and distorted the local economy (30).

POSTDISASTER SOCIAL CHANGE AND DEVELOPMENT

Disasters can also be important factors in social and cultural change. In the sense that a disaster damages or destroys a society's ability to provide, however differentially, for the needs of its members, new adjustments or arrangements may have to be formulated for it to continue functioning. Therefore, disaster research inevitably addresses the issue, or at least the potential, of change. Despite the focus on social change in the earliest social scientific discussion of disasters, the issue of long-term social change has received significantly less attention than more immediate behavioral and organizational issues. Through its tradition of lengthy field research and emphasis on social and cultural process from a developmental perspective, anthropology has perhaps devoted more attention to the implications of disasters for long-term social change than other social sciences. In some archeological research, disasters figure prominently as explanations of certain forms of cultural evolution (80, 83, 84, 127, 128).

Although nonanthropological disaster research has generally portrayed traditional societies as vulnerable and unable to cope, more or less fatalistically living under a continual reign of terror from the environment, anthropology has demonstrated the resilient and adaptive capacities with which traditional peoples respond (137). Moreover, in traditional contexts indigenous adaptations probably allowed for reasonably effective responses to hazards (96, 165, 166). However, the transformations imposed on traditional societies and their environments by the industrialized world have increased the potential of disasters for change in the traditional world. Nonetheless, the scale of change

potentially introduced by disasters needs to be addressed. In some cases imposed changes have exacerbated vulnerabilities to hazards, which results in major destruction of local societies (20). In other cases disasters have produced or accentuated stresses or forces with long-term structural implications (85, 86). Anthropological findings also tend to confirm the general conclusion that disasters are likely to accelerate changes that were underway before the disaster. Such accelerations may have implications for shifts in political economic power relations in the long-term as well as for reinterpretations of both the structure and process of development.

Disaster management and anthropological disaster research in the third world have been central in recent attempts to reorient the process of reconstruction in the developed world from replacement to development goals that address predisaster community problems (59, 93, 97, 98). Much social and economic change may occur in disasters during the reconstruction phase. When disaster strikes, very few places must now reconstruct themselves. Disasters commonly result in rapid local, state, national, or international aid. This convergence of people and goods, often foreign or strange to the local population, may ultimately be as great a source of stress and change as the disaster agent and destruction themselves (10, 17, 30, 85, 116). In large-scale devastation the reconstruction process may last almost indefinitely, often evolving into development programs, and the experts and their work become permanent fixtures in the social landscape.

Disaster reconstruction is fraught with ambivalence. On the one hand, people whose lives have been disrupted need to reestablish some form of stability and continuity with the past to recontinue their lives. For some individuals and groups the status quo ante was extremely favorable, and they count on its reconstruction. On the other hand, the disaster may have revealed areas where change is much needed. Consequently, reconstruction entails significant contention over means and goals involving persistence or change (10, 17, 94, 113, 116).

Reconstruction after the 1970 Peruvian earthquake stimulated certain social changes that produced greater freedom of action for oppressed indigenous people (85, 87). Significant changes in social and political consciousness were reported among all groups in the disaster zone about the social hierarchy of mestizos and Indians (5). However, reconstruction generally produced urban and housing patterns that tended to reinforce traditional social hierarchies (97). Moreover, although disaster and recovery efforts over a 15-year period produced some significant new infrastructure, Doughty reported no major alterations in the patterns of sociocultural behavior (24).

Postdisaster reconstruction and development after the Campania-Basilicata earthquake of 1980 were totally controlled by the dominant Christian Demo-

cratic Party to reinforce their 40-year political control over the region. The result was a retrenchment of traditional forms of development with significantly fewer benefits for the region and substantial rewards for external interests. Relief and reconstruction were seen as far more destructive to the social, moral, economic, and environmental fabric of the Sele valley than the damage done by the earthquake (17, 116).

In research after the 1964 Alaskan earthquake, Davis saw increased political awareness and an enhanced sense of identity balanced by increased dependence on government agencies in two north Pacific Alaskan villages (22). In Mexico in a climate of political mobilization, the 1985 earthquake and reconstruction stimulated the formation of militant neighborhood and student organizations that momentarily challenged governmental authority and control over relief and reconstruction. Although eventually the government asserted control, the earthquake accelerated the climate of mobilization and protest and added to new demands for accountability (113). Thus, the potential for social change inherent in the reconstruction process resides in organizational and cultural changes in political awareness at the community level. However, the potential for sound social and infrastructural development inherent in the reconstruction process has not been realized in most cases studied by anthropologists.

DEVELOPMENT AND THE POLITICAL ECONOMY OF VULNERABILITY

Since the early 1980s, many anthropologists and cultural geographers, following the growth of both cultural ecological and political economic perspectives in those disciplines, began to reconsider disasters less as the result of geophysical extremes such as storms, earthquakes, avalanches, droughts, etc and more as functions of an ongoing social order, of this order's structure of human-environment relations, and of the larger framework of historical and structural processes, such as colonialism and underdevelopment, that have shaped these phenomena (53). Disaster research from this perspective becomes essentially the analysis of the social creation of vulnerability (96a). For example, Morren asserted that (*a*) hazards emerge directly from human activity; (*b*) the severity of damage is related to the intensity of human environmental intervention; (*c*) development, encouraging dependency and specialization in individuals and communities, actually reduces both normal coping capacities and the ability to respond to hazards; and (*d*) outside disaster aid may convert a short-lived local problem into a long-term one (80a, 82).

This perspective has been used in anthropology since the early days of the discipline. Ethnographic research, as noted above, has traditionally discussed

hazards as a known part of a total environment to which traditional peoples had to adapt (139, 140). For example, modes of subsistence, social organization, and population densities of nomadic and transhumant pastoralists in Africa represent rational adaptations to marginal environments, yet economic pressures have produced overstocking and overpopulation, which make both people and land vulnerable to cyclic droughts (77a, 147).

Colonial governments and their successors, responding to nonindigenous pressures and forces, imposed systems of production, urban and rural settlement, and limits on population mobility that severely undermined indigenous hazard management (140). Zaman doubted the effectiveness of high cost, large-scale engineering efforts at flood control and recommended instead the promotion and use of indigenous ways of living with flood (164). Oliver-Smith, noting that little pre-Columbian archeological evidence of disaster-caused mortality exists to equal the 65,000 deaths caused by the 1970 earthquake in Peru, concluded that general and specific adaptations of pre-Columbian Andean cultures to their hazard-prone environment were reasonably effective (96). Furthermore, the high mortality produced in the 1970 earthquake could be traced in part to Spanish-induced changes in building materials, urban design, and settlement patterns, which may have produced a socially created pattern of vulnerability to hazards (96).

Increasing vulnerability to hazard continues relatively unabated today, largely because of the undermining of indigenous adaptations, based on long-term experience in local environments, through direct government policies or political economic forces creating production systems inappropriate to local culture and environmental conditions. Large-scale economic interventions such as mining, forestry, irrigation, hydroelectric, and industrial enterprises are creating hazardous conditions around the globe. Government economic policies designed to enhance growth are setting in motion processes with dangerous, potentially catastrophic ecological consequences. For example, governmental promotion of Amazonian colonization schemes of small producers has produced short-term survival strategies that contribute to soil erosion, declining yields, and ultimately loss of land to large-scale ranching interests that in turn magnify the deterioration of soil resources and environmental destruction (19, 120). Governmental policy or economic forces have promoted similar inappropriate forms of production in many parts of the world, which set in motion processes of soil erosion, desertification, and deforestation and produce conditions of extreme environmental vulnerability to natural hazards. In effect, such processes are creating both vulnerability and the preconditions of a disaster agent (55a, 61a, 80a).

Other processes associated with economic growth such as industrialization and urbanization have led to the concentration of populations in areas with

vulnerable conditions (82, 141). Many people on the social and territorial periphery of the global economic system are made more vulnerable by unequal economic relationships that do not allow them access to the basic resources of land, food, and shelter (76). In general, in earlier disaster research it was assumed that people lived in dangerous circumstances because they lacked knowledge of disasters or were uninformed about risks. However, recent research shows that individuals and groups may be fully aware of risks but have no choice other than to live in dangerous areas such as floodplains or unstable hillsides. This predicament is not due to lack of information or inefficient land-use planning but to the control of land by market forces that do not permit low-income groups access to safe land for residence (76). The danger of vulnerable residence sites is frequently compounded in urban areas by pollution and poor toxic-waste disposal, contaminated water, lack of sanitary services, and unsafe housing stock (97, 141).

Torry, however, questioned explanations that express disaster solely in terms of "ultimate causation" according to systemic or structural causes such as underdevelopment or dependency (145). While praising dependency explanations for debunking the view that famines result from a lack of rainfall, Torry highlighted internal proximate factors of local social stratification that result in inequalities of risk bearing and resource allocations as important to understanding famine impact and mitigation (144, 145).

To date, the famines ravaging various regions in Africa in the past twenty years can serve as the prototype of the kind of disaster we are creating. That these famines are the direct result of human intervention, largely alien to the people and environments experiencing them, is confirmed. Turton points to the irony in a situation in which the environmental destruction wrought by pastoralists is deplored and maximum limits on animal and human populations are recommended by experts enjoying a standard of living characterized by an ethic of uninhibited maximization and maintained at the cost of massive industrial pollution (147).

While most disasters today are closely linked to models and patterns of development as they intersect with the environment, few demonstrate as tragically as famine the devastating effects that environmental processes and forces combined with the historical processes of socioeconomic systems can have on large populations. Fundamentally a third-world phenomenon, famine is considered by some to be the inevitable result of the disruption of indigenous coping mechanisms by the institutions of colonialism and the penetration of the international market (20). Due in part to the coincidence between famine locations and a tradition of research sites, as well as the extended fieldwork entailed in anthropological research and the gradual onset of famine processes compared with other forms of disaster, anthropological famine research has an

identity different from other disaster research and constitutes a field and a literature that in many senses stand alone. The reader interested in famine is referred to the 1990 *Annual Review of Anthropology* (129).

APPLIED ANTHROPOLOGY AND DISASTER MANAGEMENT

Similar to most disaster research in other fields, anthropological research has an implicit applied perspective. Virtually all research is in some measure directed at the problems individuals, communities, and societies confront in disaster. There is, however, a corpus of literature in anthropological disaster research that addresses applied problems and methods explicitly.

People and communities confront a wide range of issues that vary with the scope and time frame of the total phenomenon of a disaster. Warnings are particularly problematic. The response to threats and the necessity of developing adequate warning systems have been studied (142, 146). In terms of preparedness and mitigation, Torry concluded that development planners must factor hazards into projects to avoid creating greater vulnerability (143). Traditional adaptations to environments and indigenous technical knowledge have been suggested as sources for innovative approaches to problems of mitigation and vulnerability (51, 96, 147, 162). Housing safety education in Jamaica after Hurricane Gilbert has been explored as a mitigation strategy (98). Greater linkages between reconstruction, mitigation, and development have recently been stressed (95, 143).

Early response and emergency relief operations have received some attention from anthropologists. Morren claimed that local people, usually the first responders anyway, can be effective in limiting short- and long-term losses (81). Torry assessed government food distribution programs in drought-caused emergencies in India (142). Laird has explored the efforts of local people to rechannel earthquake relief after the Loma Prieta earthquake (59). Analyses of victim and agency discourse patterns demonstrate that each party constructs the relief and reconstruction process differently (55, 79). The specific problems of different groups, such as those based on age, gender, race, or ethnicity, within communities have received considerable attention (54, 85, 92, 122, 144, 156, 160, 161).

Anthropological research on international famine relief focuses on the inefficiencies, delays, and dehumanizing effects of this relief on recipients (138, 146). Although some successes have been noted (36), much aid, particularly that involving resettlement, has created or compounded dependency as well exacerbated the disruption suffered by local people. Shipton concluded that more applied research on the functioning of and programs used by aid organi-

zations and agencies is sorely needed to improve performance in famine relief (129).

The general process of reconstruction has received some scrutiny, particularly concerning class and ethnic differentials (97, 160) and leadership patterns (17, 27, 28, 116). Postdisaster housing has garnered attention. Patterns of discrimination in housing provision (17, 92, 116, 160), relative effectiveness of different housing provision methods (70), housing changes and vulnerability (2), and specific housing problems in US disasters (6–8) have all been explored by anthropologists.

The problems associated with postdisaster settlement and resettlement planning have received some anthropological scrutiny. Glittenberg detailed the relative success of different organizational formats of settlements after the 1976 Guatemalan earthquake (40). The frequent resettlement due to seasonal floods in Bangladesh has produced considerable anthropological criticism of technological approaches to flood adjustment (50, 51, 125, 126, 162–166). Others have explored the general problems of postdisaster resettlement (93) and specific cases in varying contexts such as Peru (90), the New Hebrides (136), and Guatemala (40). Goldman's critique of postdisaster planning in Peru from sociocultural and socioeconomic perspectives is particularly enlightening (41).

Anthropological research on relief, housing, resettlement, and other assistance issues is also linked to assessments of the organization and character of assistance agencies, particularly in these agencies' implications for development. Analyses of bureaucratic structure and decision-making processes in disaster situations as well as the management of food relief have been undertaken by anthropologists (24, 85, 94, 138, 142, 146). Further, the quality and quantity of aid itself are assessed in different disaster contexts (17, 24, 25, 85, 94). Serious criticism has been leveled at postdisaster aid that is so culturally inappropriate as to be both useless and insulting (94, 139). Doughty's revealing comparative analysis of differential aid patterns for war and disaster in Latin America focuses on cultural concepts of victimhood and deservedness (25).

The applied anthropological study of disasters has also been informed by related fields in important ways. The fields of resettlement research, refugee research, and conservation and development research in particular have informed the specifically applied aspects of the discipline. Research in involuntary resettlement, particularly stemming from development projects, has provided disaster research with comparative and theoretical material on the impacts of dislocation on individuals, families, and communities (15, 49, 104, 124). Refugee studies has informed disaster research on issues about appropriate forms of aid and issues of victim empowerment (52, 75). Finally, conserva-

tion and development and political ecological research has provided perspectives on traditional and modern systems of human-environment interactions and environmental damage with potential for disastrous consequences (18, 109, 121).

The ethical dimensions of research in crisis situations have been applied to whether questionnaires are appropriate instruments for research on people under stress, which has evoked criticism of the reification of victims and their experiences. More dialogic, open-ended methods are suggested as both ethically more appropriate and methodologically more effective (9, 89).

PERCEPTION AND ASSESSMENT OF HAZARD RISK

Hazard risk is a highly contentious issue in many social and scientific contexts. Epistemologically, risk is problematical in that it is subject to differential construction by the various parties involved. Traditionally the purview of engineers, health physicists, statisticians, and epidemiologists, risk is defined probabilistically according to "real" risk, determined scientifically and objectively, vs "perceived" risk by the public, assumed to be uninformed, false, illusory, or irrational (61–63, 158). In contrast, anthropologists entering the field have tended to emphasize nonprobabilistic approaches, conceptualizing risk in its sociocultural context (158).

The major anthropological contribution to the field to date is Douglas & Wildavsky's *Risk and Culture,* a coauthored effort by an anthropologist and a political scientist, which views risk perception as primarily a sociocultural phenomenon affected by social organization and values that guide behavior and affect judgments about what is to be considered "dangerous." Douglas & Wildavsky hypothesize that different characteristics of social life, primarily related to degrees of integration and group power relations, elicit different responses to danger (26).

Risk perception and assessment issues in anthropological research focus largely, though not exclusively, on technological hazards, including groundwater contamination (35), the coincidence of toxic-waste disposal sites and minority communities (9), radioactive contamination and knowledge systems (100), radioactive contamination and social and economic impacts (107), high-level radioactive waste transport and storage (64, 110), global warming due to the greenhouse effect (39), technology acceptance (111), risk communication (157–159), and risk perception and exposure to technology (114, 123, 134–135a), risk perception, negotiation and acceptance (14, 61), and disaster-prone industry and culture (153). Themes common to many of these contributions include the social effects of risk perceptions, the conflicts between expert opinion and local knowledge, the role of culture in the formation of expert

opinion, methodological difficulties in anthropological fieldwork about risk perception, and the conflicts between development goals and environmental protection. Risk perception and assessment are grounded in the cultural norms and values that both govern and are embedded in the relationships that human communities have with their physical and social environments. In that sense, risk perception studies address both problems of immediate concern to specific communities but address theoretical questions about cultural and social constructions of reality. Risk perception research engages cultural theory directly in its focus on ideologies and constructions of social, physical, and cosmological environments.

DISASTERS: A NATURAL LABORATORY FOR ANTHROPOLOGICAL THEORY

Despite the frequent characterization of disasters as natural laboratories for the testing of hypotheses and theories on society and culture, theoretical work in disaster research has been limited. However, there have been some excursions into hypothesis testing and theory formulation about disaster stress and sociocultural responses and sociocultural evolution.

In addition to Douglas & Wildavsky's work on risk, a major contribution to social theory is Wallace's work on responses to sociocultural disorganization (148–152). Wallace's disaster research, which includes a tornado study (150), a theory of behavior in cultural crisis (151, 152), and his landmark paper on revitalization movements (149), links the issues of disaster, cultural crisis, and response and social change in one of the major contributions to middle-range theory in the social sciences of the past fifty years.

Wallace has criticized anthropology for adhering too much to its traditional mission of explaining the internal logic of traditional or non-Western cultural systems, which, he claimed, produces single-minded emphasis on normal patterns of behavior (148). Wallace saw the emphasis on normality as ignoring the opportunity that W Lloyd Warner discerned in those moments when "all hell breaks loose," when the innermost workings of communities are revealed (154).

Rossi's recent book on postearthquake reconstruction in southern Italy is the only recent work in disaster research with an explicitly theoretical goal (116). Employing quantitative and qualitative data from damaged and destroyed communities, his theoretical project is to reformulate the current discussion on "structure" and "agency" in dialectic terms and to contextualize it in empirical data. This goal alone establishes Rossi's work as the most theoretically ambitious in contemporary disaster research. Rossi's book also contains valuable methodological insights about the use of quantitative data in

theory confirmation as well as important findings on reconstruction in rural communities. The 1980 southern Italian earthquake has also stimulated further theoretical speculation on crisis and cultural response in complex societies (16).

Attempts have been made to integrate disasters into theories of response to environmental change. Loughlin & Brady (66) hypothesized that adaptive infrastructure under stress conditions will integrate constraints on social action and coordinate them with recursive environmental changes. Disasters are seen as fostering theories on response hierarchies and cost/risk assessments as well as framing and testing hypotheses about environmental change and human behavior (61a,b,c). Resource scarcity—or its threat because of potential or actual impact on food supply by natural disasters—is hypothesized as a central cause of warfare in nonstate societies (33, 34).

Archeologists have considered the role of disasters as engines of sociocultural transformation. Volcanic eruptions are important in triggering large migrations and other changes (127, 128). Most recently, it has been hypothesized that tectonic uplift, seismic activity, and cyclic El Niño events have played major roles in the emergence and decline of agricultural regimes and cultural horizons in Andean state prehistory (83, 84). An exploration of "catastrophe theory" probed its potential for explaining sudden discontinuities in social evolution according to smoothly changing control variables (37, 112, 167). Renfrew's dismissal of the relevance of catastrophe theory in explaining the effects of natural cataclysms on human societies ignores the inherence of hazards to socioenvironmental systems and seems premature given the contradictions between society and environment revealed in current discussions of general ecology and sustainability.

Paine's recent call (101) for anthropological research on issues "beyond routine" responds to Wallace's earlier criticism of anthropology's emphasis on normality and more recent calls for greater understanding of cultural praxis. By encouraging an understanding of how people faced with the accidents of history undertake the remaking of themselves through remakings in culture, Paine issues a challenge in which anthropological disaster research could realize its theoretical potential.

CONCLUSION

Currently, there is a tendency toward sharing methods, theoretical perspectives, and research questions among the social sciences. For example, anthropology has embraced quantitative methods (3a) while political scientists have used ethnographic research methods to great effect (123a). Anthropologists, sociologists, geographers, and political scientists have all shared research in-

terests and theoretical perspectives on such varied themes as structural adjustment, peasant political movements, drug use, and involuntary migration and resettlement, as well as disasters. This tendency is in part due to the increasing urgency of a number of research issues, disasters among them, with broad theoretical and practical significance. Consequently, general and scientific concern in disaster research for increasing levels of vulnerability and destruction, linked particularly to environmental degradation, uncontrolled development, technological breakdown, and societal conflict, have created contexts for common interests, sharing of methods and perspectives, and greater cross-disciplinary communication and collaboration. Thus anthropologists, cultural geographers, sociologists, social psychologists, political scientists, planners, architects, and engineers are now drawing on one another's work and are developing both theoretical perspectives and research projects that reflect the all-encompassing quality of disaster processes and events. The global nature of environmental and social problems contributing to the expansion of conditions of vulnerability and resulting in more frequent and more severe natural and technological disasters places the entire problem squarely within the purview of an anthropology that chooses to address holistically the issue of human-environment interactions for both practical and theoretical purposes.

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