

University of Delaware  
Disaster Research Center

PRELIMINARY PAPER  
#197

DISASTERS AND CATASTROPHES: THEIR  
CONDITIONS IN AND CONSEQUENCES  
FOR SOCIAL DEVELOPMENT\*

E. L. Quarantelli

1993

\*This is the longer written version of the paper prepared for a shorter oral presentation at the International Seminar on SOCIETY AND DISASTER PREVENTION held in Mexico City, Mexico on February 23, 1994. Some parts of this paper have appeared in earlier and somewhat different versions; see especially Quarantelli, 1992a, 1992b, 1992c, and 1993b.

**DISASTERS AND CATASTROPHES:  
THEIR CONDITIONS IN AND CONSEQUENCES FOR SOCIAL DEVELOPMENT\***

E. L. Quarantelli  
Disaster Research Center  
University of Delaware, USA

ABSTRACT

Our paper is organized around three central questions: What can be conceptualized as a disaster? What are important conditions that generate these occasions? What are major consequences of disastrous occasions?

In the first part of the paper we show that from a conceptual point of view, disastrous occasions are usefully dividable into "disasters" and "catastrophes". In particular we note the quantitative and qualitative differences between both everyday emergencies and "disasters" as well as between "disasters" and "catastrophes".

In the next part of the paper we extensively discuss important social factors or conditions which facilitate or generate disasters and catastrophes. It is especially noted how disastrous occasions are rooted before impact in the ongoing social developments or the social changes and trends already existing in societies. Such projected changes almost assure that in the future we will have more and worse disastrous occasions.

This part is followed by a briefer discussion of how disasters and catastrophes affect social development, especially at the macro level of societies. We especially note that there is considerable differentiation in if, where, and how, disastrous occasions affect social change and development.

The paper concludes with a short discussion of how planning for disastrous occasions is also being positively affected by social changes.

\*This is the longer written version of the paper prepared for a shorter oral presentation at the International Seminar on SOCIETY AND DISASTER PREVENTION held in Mexico City, Mexico on February 23, 1994. Some parts of this paper have appeared in earlier and somewhat different versions; see especially Quarantelli, 1992a, 1992b, 1992c, and 1993b.

## INTRODUCTION

In a scientific framework any phenomena can be thought of in terms of 3Cs. They are:

- (1) the basic nature or characteristics of the phenomena;
- (2) the factors or conditions which bring about those characteristics; and,
- (3) the results or consequences from those characteristics once they are in being.

In graphic and linear terms:

Conditions---Characteristics---Consequences

In this paper, we look at the three Cs of disastrous occasions--the conditions for, the characteristics of, and the consequences from such occasions. It is our position that while there has been some progress since the early days of research in the area, we still have a way to go in looking at disastrous occasions in a scientific framework. It is unfortunate, that there continues to be a confusing of the 3Cs in theoretical, empirical, planning and managing aspects of these kinds of social occasions. Clarification of the 3Cs is important both for research purposes and for the planning and managing of such social crises.

Studies can not produce very meaningful results if they do not proceed with some relatively clear idea of the nature or characteristics of the central phenomena being examined, that is disasters and catastrophes. Similarly, efforts to plan for and manage such occasions when they occur, can not be very effective or efficient if there is no relatively clear understanding of the nature of such social crises. Thus, what we address is both theoretically and practically important.

Unfortunately, conceptualizing what is the essence of disastrous occasions is a difficult task. Nevertheless, our discussion starts by initially considering the characteristics of disasters. It is very difficult to discuss the conditions for and the consequences of X, in this case "disasters" and "catastrophes" without first noting what the referent of X is, that is, their characteristics.

It should be noted that our prime interest is not in advancing, comparing or otherwise discussing particular or specific definitions of disasters and related phenomena. Anyone can define anything any way they want, although some views make more sense for certain purposes than others. Rather our goal is to indicate what we think are the central features or characteristics of social phenomena that we might want to call disastrous occasions and how they differ in nature from everyday emergencies or routine accidents. In short, our primary examination here is of what one might emphasize in conceptualizing disastrous occasions and not how

one could or should particularly define such occasions.

While most researchers have not paid major attention to the problem of the conceptualization of disastrous occasions, there has been a small but steady stream since work started in the area (e.g., Carr, 1932; Endleman, 1952; Moore, 1956; Fritz, 1961; Stoddard, 1968; Barton, 1970; Kinston and Rosser, 1974; Westgate and O'Keefe, 1976; Berren, Beigel and Ghertner, 1980, Hewitt, 1983; Britton, 1987; Schorr, 1987). But for the most part we draw from the most recent although mostly unpublished writings on the topic (Kreps, 1985, 1989, 1993; Pelanda, 1982; Drabek, 1989; Dynes, 1989, 1992; Dombrowsky, 1993; Gilbert, 1993; and Horlick-Jones, 1993), as well as our earlier writings (e.g., Quarantelli, 1985)

In the main, we will be discussing disasters and catastrophes, those crisis occasions generated by the threat of or the actual impact of relatively sudden natural and technological disaster agents (such as earthquakes, toxic chemical spills, floods, radiation fallouts, hurricanes, forest and brush fires, landslides, transportation wrecks and crashes, volcanic eruptions, structural failures, tornadoes, explosions, avalanches, etc.). To a lesser extent our comments are also applicable to more slow moving and/or very diffuse agents such as are involved in famines, droughts, epidemics, toxic poisonings through hazardous wastes, radiation and biological contaminations, air and water pollution episodes, etc.

We leave aside here discussing the applicability of our observations to other even more different kinds of crises, especially the ones involving social conflicts such as in civil strife, revolutions, riots, wars, terrorist attacks, acts of sabotage, product tampering, etc. (see Quarantelli, 1993b). Although there have been occasional claims that they are the same as disasters and catastrophes (see Meyers, 1991), many such conflict situations tend to last much longer and affect a much wider scale than the typical disaster or catastrophe. Even more important, such occasions are driven by an explicit intention of one or all parties involved to do harm to others.

#### CHARACTERISTICS

Some researchers have long argued in the literature that disasters are quantitatively and qualitatively different from everyday or routine crises and accidents (see Quarantelli, 1988: 49-52). For example, there are the following differences in the two occasions insofar as individual and organizational behavior is concerned:

1. The need to relate to far more and different kinds of groups operating at the height of the crisis.

There is an organizational convergence that is simply part of the massive inflow of people, communications, goods, etc. that is distinctive of the crisis time period of disasters but not of

routine emergencies. A disaster generates a "mass assault" on the impacted area from within the local community. Accidents or everyday emergencies do not. Thus, persons and organizations in disasters have to interact with far more and unfamiliar kinds of responding groups and agencies than they have to on an everyday basis or in routine emergencies.

2. The limitations on the degree of freedom of action and autonomy possible.

In disasters all lose some of their usual independence and freedom of action. Community and crisis time needs and values take precedence over everyday ones (e.g. individuals and organizations may be monitored and ordered about by social entities that may not even exist in routine times). Everyone and any group in an impacted area and often even just outside of it becomes more directly dependent and responsive to others in a disaster setting, unlike in an accident situation or routine emergency.

3. Different norms for behavior become operative.

New social norms emerge regarding what is acceptable and non-acceptable at the height of the crisis. Performance standards for organizations often change (e.g., in the medical area the speed of response in handling casualties is superseded by a need to more equitably distribute victims in the available medical facilities). Expectations of persons can also be radically altered (e.g., destruction of property is very allowable to save lives in search and rescue efforts). Emergent new norms are rare in accidents or routine emergencies, almost inevitable in disasters.

4. The blurring of the usual line between the public and private sector.

In a disaster the lines and boundaries that normally separate the public and the private spheres become quite blurred. Thus, in a disaster the need for the quick mobilization of resources for overall community crisis purposes often preempts everyday individual and organizational rights and domains (e.g., goods, equipment and facilities are without due process requisitioned for the common good from everywhere and everyone, be they persons or groups). Such legal and group boundaries and borders are seldom crossed over massively in accidents or everyday emergencies.

Therefore, our position is that a disaster is not simply a bigger accident as some police officers sometime assert. There is more than a difference in degree. The social behavior that appears is qualitatively different as well from everyday behaviors.

In this paper we also want to stress that a similar kind of distinction needs to be drawn between phenomena that might be called catastrophes and called disasters. For long we have said

that catastrophes are both quantitatively and qualitatively different from disasters. Hurricane Andrew is a recent concrete example in the United States that illustrates the more general point.

In catastrophic occasions compared to disasters, there are at least the following differences.

1. Most or all of the total residential community is impacted.

In a number of the impacted localities such as Homestead in Florida, the vast majority of all houses were damaged or destroyed making it impossible, for instance, for displaced victims to seek shelter with nearby relatives and friends as is typical in disasters. In the typical disaster, only some neighborhoods or parts of a community are badly impacted. In a catastrophe not only is most of a community affected but a number of nearby localities will also be similarly stricken as can be seen in the typhoons that hit southwestern Asia such as in the Philippines, and as occurred in areas around Chernobyl after the nuclear plant accident.

2. The facilities and operational bases of almost all emergency organizations are themselves directly hit.

In southern Florida, for instance, many of the buildings housing police, fire, welfare and local medical centers were seriously impacted making their work operations all but impossible. While in a disaster some such facilities may be impacted, the great majority usually survive with little or no damage. Thus, the first organizational responders that mobilize in disasters generally can not do so in catastrophes because they often have no place from which to operate. This happened in devastated Darwin, Australia after Cyclone Tracy, in the massive flooding in Bangladesh a few years ago as well as in the Tangshan earthquake in China in 1976.

3. Local officials often are unable to undertake their usual work roles, and this extends into the recovery period.

Related to the two observations just made, is that in catastrophic situations local personnel are often unable for some time both right after impact and into the recovery period to carry out their formal and organizational work roles. This is because the local workers are either dead or injured, and/or are unable to communicate with or be contacted by their usual clients or customers, and/or are unable to provide whatever information, knowledge, skills, etc. they can usually provide. For instance, in some recent catastrophes in developing countries practically all the medical or police personnel in some towns were fatalities. In impacted Florida communities, many social workers had no good way of communicating with or being reached by past and/or new users of their services. This general inability to provide usual services happens, if at all, only on a very minute scale in disasters, and

if it does endure only for relatively short periods of time.

4. Finally, most of the normal everyday community functions are sharply and simultaneously interrupted.

Thus, places of work, recreation, worship and education such as schools totally shut down, and the lifeline infrastructure badly disrupted results in stoppages or major shortages of electricity, water, mail or phone services as well as other means of communication and transportation. For example, this could be seen in many communities after Hurricane Andrew. This also occurred in the very widespread Armenian earthquake. In disasters, there is no such massive across-the-board disruption of community life, even if particular neighborhoods may be devastated as happened in the Mexico City earthquake of 1985 but with life in a number of areas proceeding almost normally (Dynes, Quarantelli and Wenger, 1990).

Now the distinction just drawn between catastrophes and disasters is not important in itself. The importance is that catastrophes require some different kinds of planning than do disasters. This is true whether the focus is on planning mitigation, preparedness, response or recovery measures. We noted above possible problems in sheltering victims or mobilizing organizations. This does not mean that everything is different; in fact, what needs to be further clarified is exactly what are the significant differences.

Similarly, planning and managing principles that hold for disasters are not necessarily totally invalid for catastrophes. For example, it is probably still true that the crisis time planning for even a catastrophe should be as close as possible to everyday, traditional ways of doing things. On the other hand, it is also probable that more innovation and emergent behaviors will be needed for coping with a catastrophe than with a disaster. The research and the operational problem is to establish the best balance between building on old patterns and creating new ones (Kreps, 1991a).

#### CONDITIONS

On the global scene we are inevitably faced with more and worse disasters and catastrophes in the future. Irrespective of whether the agents involved be natural or technological, there will be both quantitative and qualitative increases in the negative direction. This will result from two current social trends---industrialization and urbanization---inherent in the very dynamics of current social life. The first development almost insures that disastrous agents and occasions will increase. The second trend is raising the risks and vulnerabilities of possibly impacted populations and societies.

#### Current Social Trends

These happenings around the world will affect the appearance, characteristics and dynamics of disasters and catastrophes, and the

planning and managing of them everywhere. While these two trends are not new, they are both massive in their social effects and accelerating in their recent manifestations.

Industry with its accompanying distinctive kind of technology is spreading everywhere. For example, while in 1888 the five most highly industrialized societies were responsible for 83% of the world's industrial production, a century later the output of the top five was only 57% reflecting the continuing diffusion of industrial technology throughout the world (Lenski, Lenski and Nolan, 1991). This trend has been paralleled by an ever swelling involvement of populations in an urban way of life concentrated in constantly enlarging metropolitan areas. Thus by the year 2010, there will be 511 cities exceeding a million inhabitants each and for the first time in history the world population will be predominantly urban, 51.8%; 15 years later, there will be 639 metropolises of over a million persons (Jones, 1992).

These two related trends or processes of industrialization and of urbanization have consequences for disastrous occasions. They insure that we will have both more and worst disasters and catastrophes. Built into the very dynamics of social life as they are, industrialization and urbanization will of necessity quantitatively increase and qualitatively worsen the disastrous occasions of the 21st Century.

In the next two section of the paper we want to illustrate and explain why this will happen and some consequences. The evidence and data base we use do not come from any specific study. Instead they are derived from the corpus of the social science literature on disasters (for summaries see Lagadec, 1982, 1990; Drabek, 1986; Dynes, De Marchi and Pelanda, 1987; Auf der Heide, 1989; Drabek and Hoetmer, 1991; Kreps, 1991b; Britton and Oliver, 1993), as well as general sociological analyses of social change and trends (Bell, 1973; Harrison, 1988; Lenski, Lenski and Nolan, 1991; Perrow, 1991; Smelser, 1991, 1994; Sztompka, 1993).

#### Increases in Disaster Agents and Occasions

- 1. There are escalating kinds of technological accidents and mishaps that were relatively non-existent prior to World War II and that will increasingly result in disastrous occasions.**

To the risk of natural hazards the human race has been adding at an accelerating rate a relatively newer risk, those stemming from technological accidents and mishaps (for annotated bibliographies on see Herring, 1989; Hughes, 1992). The latter happenings will increasingly contribute to the appearance of disastrous occasions. We are faced with ever more disasters in the technological area resulting from human errors and collective mistakes of groups (Perrow, 1984). To the "Acts of God", we have been adding at any escalating rate the "Acts of Men and Women" or "Society".

Technological hazards are a relatively newer class of danger which the contemporary world is only beginning to fully recognize. Disastrous occasions brought about by the unintended consequences of technology has largely been a product of the large-scale development of industry initiated by the 19th century European industrial revolution. Of course, what has been in being in developed societies for some decades now, is rapidly occurring at present also in developing social systems. To be sure, mishaps associated with technology have occurred since the first tool was produced by a human being. However, in terms of social disruption and the endangering of the social infrastructure, the scale of consequences only began to reach significant proportions with the development of large industrial complexes to mass produce myriad goods (Britton, 1991: 1-2).

The major technological threats are currently in the chemical and the nuclear area. The manufacture, processing, transportation or distribution, storage, and the use of many products of these two areas are inherently hazardous. They almost insure quantitatively more and qualitative worse future disastrous occasions.

a. The chemical area.

Chemicals have truly transformed the world and modern societies are impossible without them; their use reflects a widespread desire to have higher standards of living and lifestyles which otherwise could not be achieved. The technology of chemistry has consciously been cultivated and applied because of the benefits involved. This is true not only in developed but also developing societies, as indicated by the fact that in India the chemical industry is a 20 billion dollar a year industry that accounts for 10% of the gross national product and 40% of the nation's gross industrial output (Ramasubramanian, Mitra and Bandopadhyay, 1987: 180).

But as Bhopal showed, there are multiple risks associated with the production, transportation, storage and use of dangerous chemicals for there are multiple ways in which human and other organisms, plant life and fauna, and physical material objects can be destroyed, damaged or directly negatively affected by a dangerous chemical. A chemical emergency or disaster can involve many perilous happenings unlike the typical earthquake or volcanic eruption. The referents of the term "chemical hazard" are many.

Especially important is that even localities which in the past had none or few risks from natural disaster agents, are now vulnerable if they have any roads, railways or waterways near toxic chemical spills, explosions, or fires. In a sense, the creation of major transportation infrastructures has reduced the geographic selectivity of possible disastrous impacts. All inhabited areas have now become vulnerable to threats from hazardous chemicals even though there be no manufacturing, storage or use facilities in the

vicinity. Not all communities are subject to major natural hazard threats; but now almost all are at risk as they are increasingly subject to dangerous chemicals being more and more moved around.

Furthermore, the threat of greater disasters of this kind is spiraling because of the greater amounts of dangerous material involved. For instance, from 1960 to 1980, not only has the number of seagoing tankers carrying petrochemicals doubled, but their shipping tonnage has expanded sevenfold! Economic considerations are leading to the use of ever larger tankers. So increasingly, there is something bigger to spill, explode or burn on waterways as illustrated by the Amoco-Cadiz oil spill off the French coast, the famous Exxon Valdez oil spill off Alaska, and more recently the Aegean Sea tanker oil spill and fire in December 1992 at the harbor of La Courná, Spain, a city of about 250,000 people.

In addition, to the in-plant and transportation kinds of acute chemical hazards types of disastrous occasions, we have also been adding the more slowly developing and diffuse types associated with hazardous waste sites. Love Canal and Times Beach in the United States as well as Seveso in Italy are examples of what we may expect more in the future. In fact, the Seveso Directive issued by the Council of European Communities accepts the probability of such future disasters by setting forth as legal policy the idea that citizens must be adequately informed of the nature of and extent of existing hazards, the planning measures being undertaken, and what might be expected of a disastrous occasion. In the former Soviet Union it is estimated over a million residents live in contaminated areas, in the 300 towns and cities where chemical weapons were once produced, stored, tested or destroyed (Shargorodsky, 1993).

**b. The nuclear area.**

Another increasing source of danger is the nuclear power industry. It has less than a half century existence. But it was developed because it initially seemed to offer a relatively dependable and relatively inexpensive source of energy especially for industrial expansion, compared with other energy sources such as oil which was seen as eventually depletable and increasingly costly to obtain. A move in the direction followed made much economic sense.

However, the risks associated with the development of nuclear power has been exemplified first by Three Mile Island, then Chernobyl. We may expect more along those lines given that there are over 435 commercial nuclear plants in existence at present, and about 100 more under construction. In fact, in October, 1992 in a nuclear plant in Japan at Mihama, 70 miles from Tokyo, a reactor core meltdown was only aborted by the last emergency shutdown mechanism in place. It should be noted that such a happening would pale the negative effects of Chernobyl, which contrary to much popular and even official thinking was far from a worst case scenario.

Apart from in-plant nuclear plant problems there are the risks associated with the transport of nuclear wastes over long distances. In the United States alone, by the year 2000, there will be about 47,900 metric tons of spent fuel, compared to 12,900 tons in 1985, to be shipped to some deposit somewhere. Also in the long run the dozens of societies that presently have nuclear plants will eventually be faced with the problems stemming from their necessary shutting down (and there were 435 commercial plants in existence at the start of this decade, see Meshkati, 1991). The large volumes of radioactive wastes resulting from the dismantling of such nuclear facilities will pose problems of disposal.

That this is not a purely academic issue is indicated by the recent disclosure of a not widely known explosion in the former Soviet Union in 1957. That year, a tank of radioactive waste exploded at a weapons plant near Chelyabinsk, spewing 70-89 tons of waste. At least 270,000 people are estimated to have been exposed to the cloud. While even now few of the negative consequences are known, it has been reported that as a result of the ensuing contamination, 23 villages were razed, over 10,000 residents were permanently resettled, and 17,000 acres of farm land were turned into a nature preserve (Monroe, 1992: 535-6; see also, Medvedev, 1979)

Eventually too, the presently stored material is going to have to be transported from many places to some chosen sites, and naturally that raises the probability of some accident in all countries involved in such transportation (this is complicated by the fact that some European nations, ship their nuclear waste overseas). In addition, there is the added military related problem in some countries of dealing with the highly radioactive materials that have to be handled and that also accumulate from the increasing decommissioning of nuclear submarines, the dismantling of nuclear weapons, and the closing of nuclear weapon plants.

**2. There are technological advances that reduce some hazards but add complexity to old threats.**

Of course modern technology can be used to try to eliminate or reduce some risks. The medical health area is marked by any number of such successful efforts. Unfortunately, sometime positive consequences from technological applications are accompanied by negative effects. There are two aspects to this: (1) preventive or protective measures which indirectly can lead to other kinds of disastrous occasions, and, (2) the scale of chain reactions possible in modern societies which as a result of network linkages can turn a minor emergency into a major disastrous occasion.

An example of the first is fires in high rise buildings. In combination with the highly combustible and toxic construction and furnishing materials presently used, they have brought an additional threat dimension to the situation. Buildings are prevented from being burned by raising the probability of their

modern fiber optics carry 10,000 time more calls than the old copper cables they replace. An accidental cut of a single fiber optics can cut off entire metropolitan areas (Lee, 1992: 8).

As an example we might cite figures from a recent incident in Hinsdale, Illinois where a fire disabled a major Bell Telephone switching center in the Chicago area. This telephone outage as a result of its links to computers affected both voice and data communications for more than a half million residents and business customers in six metropolitan suburbs for periods ranging between two days to three weeks. In addition, local and long distance communications for both telephone and computer networks were also severely affected since the Hinsdale center affected was an aggregation point for major telecommunications links. The outage:

affected the normal operations of dozens of banks, hundreds of restaurants dependent on reservations, three large catalogue sales companies headquartered in the Chicago area, about 150 travel agencies, most of the paging systems and cellular telephones in the affected area, and hundreds of businesses located in the area or others not located in the affected area but conducting business with those that were...At present, a conservative estimate for the business losses and the repair costs of the accident are set at \$200-300 million (Pauchant, Mitroff, Weldon and Ventolo, 1990: 244).

### 3. New versions have developed of old or past dangers.

Certain dangers that take particular forms have been around for centuries. But in the modern world, the versions of the risks involved have taken new forms especially as large scale cities have come into being. Inevitably these kinds of communities require elaborate lifeline systems that literally are the physical or mechanical infrastructures on which they rest. For a small village, a well or two can provide the necessary water; for metropolitan areas, distant reservoirs, dams, pumping stations, pipelines and gauges, monitoring points, etc. linked together in complicated ways are needed to generate and distribute the water. This can create new versions of old or past dangers.

For instance, increasing chronic water shortages are affecting many societies, including developing ones. This is partly related to the great need for water to support the process of industrialization. A recent report of the Worldwatch Institute noted that besides parts of the western United States:

inhabitants being asphyxiated.

Even plane crashes are interesting along this line. Research has generally shown that the ensuing fires kill more passengers than the crash itself. Eighty percent of those that do die from the fire actually succumb to the gas and smoke from the lightweight burning cabin material! It makes a plane safer along certain lines if less heavy material is used; however for economic reasons such material is seldom fire proof.

Technology sometimes is directly used in efforts to improve safety and reduce the possibilities of accidents and mishaps. This is a laudable effort but not necessarily always achieved. This can partly be seen in the following quotation from Lee Thomas, a one time head of the US Environmental Protection Agency. He said:

It is entirely possible that somewhere in the country toxic metals are being removed from the air, transferred to a waste water stream, removed again by water pollution controls, converted to a sludge, shipped to an incinerator and returned to the air (New York Times, May 11, 1986).

He is pointing to the fact that some technologies that reduce or prevent the development of certain kinds of risk or environmental threats do so by solutions that can generate their own dangers.

But the linkages between happenings which may have ultimate negative effects, can be even more direct. This is because as technologies are elaborated and enlarged to meet the economics of scale, a small mishap at one point can bring down the total network or system. For example, there have always been electric power system failures; in fact, outages occur on a small scale almost every day even in developed societies. They are recognized as such and coped with as normal emergencies by the public utilities. But not only can something in a far distant place have local effects, but the elaborate linkages almost insure that even in societies where the power supply is normally dependable eventually there will be large scale effects as in the widespread blackout in 1965 which occurred in southern Canada and the northwest United States, and in France in 1978 and the province of Brittany in 1987 (Lagadec, 1990: 107). In fact, in October 1992, eight of the eleven states in Malaysia and a third of Singapore concurrently lost electricity in an interrelated massive power failure in the two Asian countries.

Massive glitches that impair telephone systems are also becoming increasingly common in many societies. In 1984, such a system outage in Tokyo, Japan affected 89,000 subscribers and cost around 300 million dollars. In 1991, eleven major phone system outages affecting metropolitan areas occurred just in the United States alone. In the report accompanying those figures it is noted:

Many areas could enter a period of chronic shortage during the 90s, including northern China, virtually all of northern Africa, pockets of India, Mexico, much of the Middle East...Where scarcities loom, cities and farms are beginning to compete for available water (Postel, 1989: 1)

Droughts used to be mostly a rural problem. This is no longer the case. In November, 1993 the water supply of Athens, Greece had fallen so low that severe rationing would have had to be quickly imposed if rainfall did not soon increase (Quinn, 1993). In different parts of the world, urbanized localities are finding themselves faced with shortages or reduced water supplies.

Moreover, in the future there will be an acute disastrous occasion if an urban area runs out of water or has enough only for the most vital of water needs. This is most likely to occur in combination with the collapse of a major tunnel, pumping station or other critical facilities of a water supply system.

This last probability is escalating because of a deteriorating public works infrastructure of lifeline systems in a large number of older cities in the Western world. The prevalence of decaying bridge and tunnel structures, crumbling highways, obsolete and overloaded waste water and sewerage treatment plants, worn out sewer and water mains, aging subway systems and pipelines, suggest many potential disastrous possibilities beyond the isolated and occasional accidents of the past. A flood in the downtown area of Chicago in 1992 as a result of the collapse of a 100 year old underground freight tunnel is a specific case in point. It resulted in a major electric power cutoff shutting down the Board of Trade with a resulting loss of 25 billion dollars in trading, and leading to the evacuation of department stores and hotels, and disrupted businesses for weeks.

Put another way, these problems are appearing because the physical infrastructure involved is reaching the end of its normal lifetime. One can project that this also will become a problem for urban areas in developing countries compounded by the fact that there is reason to believe there is even less maintenance and accident prevention measures for the urban lifelines in them than exist in developed societies. This is illustrated by the major failure in 1989 of a pipeline in Russia which killed at least 575 persons, as well as the explosion of a natural gas pipeline in 1984 in Gahri Ohoda, Pakistan which killed 60 people, and the explosion at the liquid petroleum gas plant at San Juan Ixhuatepec near Mexico City in the same year which forced several hundred thousand of nearby residents to evacuate and may have killed several thousand people.

None of the disasters likely to occur from these factors are totally new in the geophysical or physical sense, but they

represent new versions of old threats, either because of where they could occur or the large scale nature which they can assume.

**4. There is the emergence of new kinds of technological accidents and mishaps that can and will lead to disastrous occasions.**

**a. Developments in computer technology.**

A major new threat that is developing is associated with all the disastrous consequences that will come from the computer revolution that human society is presently undergoing. Use of computers undoubtedly have improved disaster planning and managing, as well making life easier for most of us in many ways. But our increasing dependence on computer technology will magnify future disastrous occasions and turn some minor emergencies into major crises. This is particularly true in that many governmental and business sectors are increasingly computer based for the data and information they need to function, sometimes literally from minute to minute. Thus:

It is...estimated that more than 85% of the largest firms in the US are totally or heavily dependent on computer technology and that, on average, a business would lose 25% of its daily revenue after the sixth day of its system breakdown, while this figure is close to 40% for the financial, banking and public utility industries (Pauchant, Mitroff, Weldon and Ventolo, 1990: 254)

These figures are for the United States but comparable figures could be found for countries in Western Europe. To the extent that developing countries move to computerize their businesses and industries, and there are many advantages to doings so, they will also increasingly become vulnerable to computer failures.

Now it can be predicted with certainty that computer systems and their networks will cease to function, or function incorrectly (and we leave aside deliberate sabotage by the use of computer viruses). We will then have a really **new** kind of disaster--a computer disaster, with all kinds of negative chain reactions of an economic and social nature. The Hinsdale occasion we discussed earlier is but a simple example of the complex disastrous occasions that may stem from partial failures of computer networks.

**b. Biotechnological advances.**

There are also going to be disastrous occasions that will be produced by developments in biotechnology, especially genetic engineering. Basically, this technology involves altering the blueprint of living organisms--plant, animal or human--and creating new characteristics, some of which are very useful (e.g., various

kinds of oil and chemical waste eating bacteria have been created that can be used to help clean up spills!). However, there clearly are all kinds of potential disastrous possibilities with this kind of technology. There can and will be the creation of or the escape from control of some altered organism that cannot be checked by presently known means. Our ability to custom design living organisms almost insures that one day there will be some almost Frankenstein-like bacteria, plant or animal let loose on the world.

We feel as confident in making the assertion that biotechnology will bring us a major catastrophe sooner or later. In fact, just as the 1970s was the time when the world became aware of nuclear power threats, the 1980s of the chemical hazards risks, the decade of the 1990s could very well be when we will have a Chernobyl or Bhopal-scale like biotechnological disaster.

Actually a forerunner of what could occur in the biotechnological area is suggested by a related although slightly different kind of disaster in 1979. In that instance, biological toxins were accidentally released at a Soviet research center. Probably 1,000 workers were killed and a 20-square mile area around the city of Sverdlovsk was contaminated by the release of highly toxic anthrax spores. To the extent that any country anywhere in the world sets up facilities for biotechnological purposes, it will create risks in the production, storage, transportation, distribution and use of the products involved (see the discussion of future biological hazards of all kinds by Bradford and her colleagues, 1993).

**5. There will be an increase in multiple or synergistic type disastrous occasions resulting in more severe impact consequences.**

There has been very little recognition given to the fact that natural disaster agents will increasingly generate or magnify concurrent technological disasters. Increasingly so, because of the accelerated production, transportation and storage of hazardous substances of all kinds, natural disaster agents which in the past would have simply been natural disasters can now create technological ones. For instance, a flood could inundate a chemical plant complex (some of this occurred in the 1993 midwest American floods). The convergence of a radiologically active cloud and a tornado could pose a very threatening situation. As an example, in 1961, windstorms spreading radioactive material in the Lake Karachay region in the Southern Urals increased by about 30 to 50% the land area previously contaminated by an earlier nuclear disaster in Russia. The earlier technological disaster was magnified by a later natural disaster agent (Porfiriev, 1992).

Not often noticed is that this process can also go in the other direction. Several examples can be cited. It has long been known that the injection of fluids into the ground so as to recover oil and dispose of waste can trigger surface land faulting. In one

instance, this led to the collapse of a dam, the emptying of the Baldwin Hills Reservoir and some deaths and property loss in metropolitan Los Angeles (Hamilton and Meehan, 1971: 333). Or just the building of dams for the purpose of creating reservoirs to impound water for residential or industrial uses may also set off earth tremors. In one of the least seismic areas of the world, a reservoir behind Koyna Dam appears to have triggered a series of shocks that devastated Koyna Naga, India in 1967 killing 177 residents, injuring around 2,300 and damaging or destroying most of the buildings in the community (Earthquake, 1972).

#### Enlargement of Social Risks and Vulnerabilities

Parallel to the increase or negative changes in agents for disastrous occasions, are transformation in the populations which can be impacted. The end result of these trends, mostly stemming from the urbanization process, is an enlargement of social risks and vulnerabilities for all societies, in particular for developing ones. Thus, even if there had been absolutely no change in agents or occasions, we could still expect more and worse disastrous occasions just from the changes that are occurring in the social entities that are potential candidates for future impact.

- 1. Both natural and technological disaster agents will simply have more to hit and along some lines will have greater impact.**

Disastrous occasions are social happenings involving some vulnerable entity; they are not merely the presence of some risk or hazard in some physical sense. Thus, natural hazards will only remain hazards and can not become disasters unless there is some effect on social life. An earthquake hitting a totally uninhabited area is simply an earthquake. The same is true with respect to technological agents.

As we discussed earlier such agents definitely are on the increase. Now the occurrence of physical hazard agents are probably not increasing per se, at least on any observable short range human time scale, even though it is known that some like hurricanes can fluctuate considerably over time. But we do know even now that what any physical agent can socially impact has and is changing.

Many different regions of many countries, both developed and developing, are being subjected to unprecedented population growth, building of structures, and economic development. For a variety of social reasons mentioned at the start of the paper, many areas are being built up. This means that more than ever before there are greater number of people and greater amount of property vulnerable to the risks of different disaster agents. For example, there are more people and settlements than ever before in riverine flood plains. Because of social factors, where in the past there was marsh or swampy areas, there are now housing complexes and

industrial parks. The same picture could be drawn for earthquakes. For example, 15 of the 20 most seismic countries have high population growth, and 64 of the world's 90 largest cities are located in seismic zones (Coburn and Spence, 1992). There is simply more of a built environment they can impact. Where empty or very sparsely populated space might have been hit in the past, in the future many people and their built environments will be hit. The property destruction wrought by Hurricane Andrew earlier this year in Florida would have been considerably less just a decade ago because there was much less of a built environment to impact.

It is not only that there is more to impact. It is also that the very process of urbanization in itself increases the physical vulnerabilities of all built up localities, and adds additional risks. They do so, for example in the instance of flooding, in that natural drainage areas are reduced or eliminated, in that dams and levees are built that lead to vast pools of water accumulating far beyond that which would normally occur. The 1993 floods in the midwest United States and those in northwest Europe in Germany, the Netherlands and France which were the worse in more than half a century, partly resulted from flood protection mitigation measures that had been put in place, and partly from the elimination of natural drainage areas and wetlands. Thus, in Germany the flooding was attributed to too many dikes, concrete embankments and artificial channels built along the Rhine River and its tributaries, and it was argued that low lying lands should be allowed to return to their natural state (Whiteny, 1993: 4). The same has been stated about the recent Mississippi River flooding.

To the extent that developing countries industrialize and concentrate much of that process in urban localities, the more also a target they will present for all kinds of hazards. The result could be a natural or technological disaster, the latter being illustrated by the hydrocarbons explosions which occurred in Tacso, Venezuela in 1982 which killed 145 persons (Cutter, 1991: 277).

We can not only be certain of the happenings of certain kinds of technological disastrous occasions, but they too can result in qualitatively worse effects than certain other kinds of impacts. For example, chemical poisonings and radiation contaminations often require complex, sophisticated and labor intensive kinds of medical treatment. They can and do put much more of a strain on emergency medical services than the "ordinary" disaster. For example, in Bhopal, the local emergency health system was overwhelmed both by the numbers and by the kinds of medical problems faced. The city's biggest hospital, the 760 bed Hamidia, admitted 1,900 seriously ill patients the first day and eventually treated more than 70,000 victims (Bowonder, Kasperson and Kasperson, 1985: 32).

**2. More vulnerable kinds of population will be impacted than in the past.**

Populations in future disastrous occasions, because of social changes--some of lifestyle, others of a demographic nature--will be more vulnerable to negative effects.

Changes in lifestyles can increase vulnerabilities. For example, notions of leisure times and vacations have become very widespread in developed societies. This in turn leads to the creation of certain kinds of resort areas which are particularly vulnerable. Such changes in lifestyles are leading more people to be tourists in localities at risk from such happenings. For example, the weekend, seasonal and holiday population in the tourist resort areas on the eastern the United States is usually 10 to 100 times more than the permanent coastal residents. A similar change in population patterns is true in Europe with respect to avalanches in ski resort villages. Also, increasingly families are building vacation homes in wildlands that are vulnerable to brush fires.

Then there are other even more fundamental changes in family patterns; the form of the family has been changing. For example, more and more, the recent traditional type of the family in the Western World known as the nuclear one, a husband and wife with children, is less and less the dominant form. Households are increasingly made up of members that consist of single people, childless couples, both male and female single parents, unmarried same or different couples such as heterosexual partners and gay couples, as well as unrelated roommates (this is increasingly also the patterns starting to appear in cities in developing countries). Much disaster planning at least in the West implicitly assumes that most households will be made up of nuclear families. But this is a diminishing social pattern. Furthermore, the other types of growing kinds of households all present different kinds of issues and problems for disaster planning and managing. For example, the homeless presented unexpected major relief problems after the Loma Prieta earthquake and Hurricane Hugo in the United States.

Then there have been and are changes occurring in the demographic characteristics of populations in current societies. These can result in qualitative changes in vulnerability. As an example we are increasingly getting an older population in at least the majority of developed countries around the world such as France and Japan. For various reasons older persons tend to live in areas which are more subject to risks such as the state of Florida in the United States. But irrespective of where they live, it is known that older people among other things are proportionately more likely to be injured in disasters. In addition, older victims find it more difficult to make up for property losses; in fact, the elder usually have proportionately more to lose.

In developing countries, the problem is just the reverse since they usually have very young populations. In the Bangladesh Cyclone of 1991, which killed an estimated 130,000 people, 63% of the deaths were in the under 10 age category even though this category

represented only 35% of the pre-cyclone population (Mushtaque, Chowdhury, Bhuyia, Choudhury and Sen, 1993: 301). But along with the elderly it is also the very young who are more likely to be casualties in disastrous occasions.

There will also be expanding risk for those already at social disadvantage in a community. The poor are the most vulnerable in several ways. They generally live in more dangerous locations such as flood plains or around chemical plants. It was not the well off who lived in Guadalajara the Reforma district around the PEMEX gasoline distribution center, when a series of sewer-drainage explosions along an 18 kilometer course ripped through 13 square kilometers of the area killing several hundred, injuring around 1,500, damaging at least 1,100 residences, and doing an estimated 300 million dollars of property damage. In fact, cities in developing societies typically have huge slums. Natural disasters such as floods and typhoons which have hit Rio De Janeiro and Hong Kong respectively have typically devastated squatter settlements in those communities. In some instances, when technological disasters occur, the impact is much greater than would otherwise be the case. For example, the gasoline leak from a pipeline which exploded in Cubatao, near San Paulo in Brazil in 1984 set off fires in a nearby shantytown that resulted in 508 deaths (Cutter, 1991: 276).

Also, after impact the poor are less able to cope with the losses suffered in disasters. The problem is compounded by the fact that certain populations in urban areas are particularly heterogeneous.

**3. Increasingly metropolitan areas will be impacted: along certain social lines they are not well suited for coping with disastrous occasions.**

For a variety of reasons, some of which have already been indicated, metropolitan areas will be increasingly subjected to disastrous occasions. In general, the social characteristics of such localities will tend to increase the difficulties in many kinds of crises because of the highly bureaucratic nature of urban organizations, and the heterogeneous sociocultural patterns of urban groupings. Since both make planning for and managing social crises more difficult, the more there are disastrous occasions in urban areas, the more there will be problems.

**a. Urban bureaucracies.**

Stereotypic negative notions of bureaucracies should be avoided when discussing such types of social organizations. Nevertheless, it is true that bureaucracies are not the most adaptive social organizations for coping with fluid and ambiguous crises, among the very hallmark of the emergency time periods of disastrous occasions. Disasters involve nonroutine occasions. In those kinds of situations, as disaster studies have consistently found, new or emergent rather than traditional or standard behavior patterns are

more adaptive for the demands or problems that surface. For example, hospitals and the hospital system can better provide emergency medical services if the bureaucratic authority structure, the traditional decision making process, and even the traditional division of labor, are not completely followed (Quarantelli, 1983).

However, research indicates that threatened organizations are inclined to be rigid and detached, relying heavily on existing strategies, routines and resources to pull them through such occasions. Put another way, since bureaucracies are not the best social organizations to prepare for and respond to disastrous occasions, their presence in the midst of such crises, can only magnify the problems that will appear.

All cities everywhere have many everyday problems which their bureaucracies do not handle too well with the problem particularly acute in developing societies. It has been written of them that:

almost any account of Third World urbanization of cities reads like a litany of seemingly intractable problems. What is more, by interchanging a few names and adjusting some figures slightly the litany is depressingly similar throughout much of Asia, Africa, and Latin America (Dogan and Kasarda, 1988: 24 quoting an unreferenced McNulty writing)

Of course, an actual situation may be more complicated than might appear at first glance, but not necessarily in the negative direction. In Mexico City, the formal governmental structure is on paper a highly centralized and rigid bureaucracy. However, after the 1985 earthquake, a detailed study found that in reality the system was somewhat functionally decentralized at the informal level. The result was that at the local level the response by organizations coped relatively well with a series of problems such as the restoration of the public utilities (Dynes, Quarantelli and Wenger, 1990). But in the main, it is to be anticipated that urban bureaucracies will not cope well with disastrous occasions and as such will make populations more vulnerable to disaster impacts.

#### **b. Heterogeneous subcultures.**

It is widely believed that many segments of urban populations live in very disorganized and anomic social settings. This is not correct. This perception mostly reflects the view of dominant and majority groups when they look at the non-mainstream social groupings that increasingly live in urban areas. But far from disorganization, what is present are well integrated social worlds and subcultures whose members simply have different values and beliefs than the dominant social pattern and culture, most stemming from different ethnic and/or religious backgrounds. Many of the metropolitan areas in developed countries such as France, have been

the end point of migration from developing countries (and in developing countries the cities too are the magnets for rural migrants, easily seen in Mexico City). A major consequence is that heterogeneity characterizes their urban way of life.

These kinds of population mix can affect response in disastrous occasions in a variety of ways, make planning even more complicated than usual, and generally raise the risks and vulnerabilities for the persons and groups in the mix. For instance, some ethnic and minority groups see hazards differently from other groups, with some assuming natural hazards can be overcome and others assuming human beings have to accept and adjust to threats. Depending on the belief, this can affect efforts at mitigation or prevention of disastrous occasions. People from different cultures can also vary in their support for protective actions, with some taking a somewhat fatalistic and resigned position because of certain kinds of religious values. Adoption of emergency preparedness measures can be affected by this. Also, some groups have very extended kinship systems which can provide considerable support at times of crises; conversely, other disaster victims because they trust no one other than their own, may have few or none to turn to for social support. As another example we may note that studies show minorities in most societies often have the most problems recovering from disastrous occasions because they frequently are not that socially visible to those providing help.

Our point is that any kind of sociocultural mix along any of the lines indicated will complicate and generally make less efficient and effective any aspect of crisis planning or managing. A relatively homogeneous population is much easier to plan for and will have less risks and vulnerabilities in disastrous occasions.

#### **4. Increasingly, localities will have disastrous conditions from sources that may be quite distant.**

An interesting pattern for some disastrous occasions of the future is that their source and their point of impact will be quite distant from one another. Sometime impact is within a limited geographic area, although threatening localities away from the original risk source. For example, a chlorine gas cloud in Florida drifted about 28 miles from where a train accident occurred; if the same derailment had occurred in a metropolitan area rail yard in the United States, millions of people would have been put at risk. As another example, a 1980 pollution episode of the Po River in Italy extended over a 60 mile stretch.

But more important are when hazardous effects go over important jurisdictional boundaries, sometime of nation-states. For example, the 540 mile Meuse River arrives in Maastricht, The Netherlands loaded with human sewage and chemical waste picked up earlier upstream in France and Belgium. As is well known, the radiation fallout from Chernobyl fell in various parts of the world, but

especially in certain European countries. The radiation falling on moss in Lapland in northern Scandinavia affected reindeer who used it for food which in turn affected natives who because they used the reindeer for several purposes, suffered economic losses. The toxic contamination of the Rhine River which starting at Schweizerhalle, Switzerland, eventually affected six different nations and polluted upriver for almost 800 miles, or the Ohio River pollution which had severe consequences for several states are again harbingers of what we might expect more in the future.

Consequences at a distance are not confined to technological type disasters. A Japanese bank recently analyzed the effects on the world economy if a major earthquake impacted Tokyo. It projected that because of the central role of Japan in the internationalized financial markets, the economic after shock would be felt around the world. It noted that in 1987, some 18.7% of the about two billion in foreign money which flowed from abroad into US securities came from Japan. The report also estimated that if the earthquake had occurred in 1988, world economic growth would have been curtailed by 0.3 percentage points in 1989; by 0.9 percentage points in 1990; by 1.5 points in 1991; by 2.1 points in 1992; by 2.4 points in 1993 and by 2.6 points in 1994 (Japanese, 1989: 1).

**5. Certain future disastrous occasions have catastrophic potential even if they would produce no casualties nor have physical impact.**

Some disastrous occasions in terms of their direct effects will be mostly economically costly. It has been noted, for instance, that early discussions of such occasions equated the magnitude of impact to the number of people killed or injured, or to the amount of property damaged. Unfortunately, things are not this simple. The accident at Three Mile Island (TMI) provided a demonstration that factors besides injury, death, and property damage impose serious costs. Although there was not a single death at TMI and few if any latent cancer fatalities are expected, as Slovic has written:

no other accident..has produced such costly societal impacts. The accident...certainly devastated the utility that owned and operated the plant. It also imposed enormous costs (estimated at 500 billion dollars...) on the nuclear industry and on society (1987: 282).

It did this through stricter regulations and the reduced operation of reactors worldwide, greater public opposition to nuclear power and greater reliance on more expensive energy sources, and increased costs of reactor construction and operation.

As a variant of this, we may note that some future disasters will be very socially disruptive, less because of their direct physical impacts, but as a result from the way that the hazard will be

perceived. A good example of this occurred in Brazil in 1987. A cancer treatment machine abandoned in a junkyard released some dangerous cesium 137 which through radiation contamination killed about four people and seriously affected about 44 others.

But far more consequential was the perceived risk to and from anyone that initially resided in the affected locality, namely Goiania, Brazil. Over 100,000 residents out of a total population of about one million underwent Geiger counter examinations to detect possible contamination; about 8,000 formal certificates were issued to counter the effects of being stigmatized as a hazardous carrier of radiation. This was a reasonable coping effort since anxiety over potential contamination led hotels elsewhere in the country to cancel reservations of persons from Goiania, buses and airplanes to refuse to take Goianians as passengers, and doctors and dentists not taking new patients who did not have the certificates. There was also cancellations of scheduled conventions with regional tourism falling over 40%; property values fell too, with sales for the entire city and state being affected. Possible as much as 50% of the state's export sales were lost during one month with the area's agricultural products being boycotted (or purchased at 50% of value). Even textiles and clothing manufactured in Goiania were affected--some losing nearly 40% of their value (see Petterson, 1988).

Clearly these kinds of future disastrous occasions resulting mostly in non-physical but massive social, economic and/or psychological disruptions will have to be planned for in the future. There will be a need to get away from equating disastrous occasions only with fatalities, a rather narrow and almost completely discarded notion in most of the recent social science research literature.

#### CONSEQUENCES

The effects of disastrous occasions can be many, multiple and myriad in a great variety of ways. However, in this paper we are only concerned with how these occasions may affect social development or influence social change at the more macro levels of social systems or societies. As such, although they are very important, little attention is paid here to consequences at the individual, household and small group levels of behavior (for such effects, see Drabek, 1986; also Nigg, 1993). Rather our prime concern is if, how, and in what ways disasters and catastrophes have developmental consequences for organizations, communities and societies, the higher macro levels of social activities not reducible only to the acts of the human beings within them.

It is also necessary to stress that much of what goes on in a recovery period after a disastrous occasion is recovery, and not social change. Restoring residences, businesses, public services and infrastructures, employment, schools, economic activity, tourism and other social activities to preimpact levels does not in

our view constitute social development or change (see Drabek, 1986: 200-249 for summaries of such activities). Although important, such behavior, even when it is differentiated (Nigg, 1993: 261), is basically part of the recovery process bringing the disrupted parts of the system back to its preimpact status (see Rubin, Saperstein and Barbee, 1985). Our interest is in social change or development, that is a move in some significant way away from preimpact levels and directions. There is no implication in saying this that the changes are always necessarily functional or positive in outcome; as discussed later, this is not always the case.

That disasters and catastrophes sometime and under some circumstances bring about change seems indisputable. There is historical evidence in support of such a general contention. Historical studies indicate that the Black Death epidemic in Europe in the 14th Century (Ziegler, 1969; Gotfried, 1983; Huppert, 1986) and the massive Lisbon earthquake in Portugal in 1755 which killed 60,000 brought about some major changes not only in the societies, communities and populations affected, but elsewhere also.

However, the social science literature on the topic of the social consequences of disastrous occasions has been rather uneven (see Nigg and Tierney, 1993 for a discussion of why social change is not well documented in the literature). There are occasional exceptions (see, e.g., Geipel, 1991 on the long run effects of the Friuli earthquake). But the research studies as a whole have not been as many or as systematic on this phase of the disaster cycle (mostly recovery) as they have been especially about preparedness and response in the emergency or crisis phases of disastrous occasions (Drabek, 1986: 250). As such, our discussion here will be briefer and more delimited than our extensive comments on the social developmental conditions that lead to disastrous occasions.

Nevertheless, at least four major themes can be discerned in the observations and findings that have been made about major developmental or social change macro level effects or consequences of disasters and catastrophes. The themes are:

- (1) Permanent social changes have to be distinguished from temporary modifications;
- (2) There are few if any across-the-board effects--rather there are differential consequences in different social spheres and activities;
- (3) Changes are more likely from catastrophes than from disasters; and,
- (4) There can be positive as well as negative outcomes in social development.

Let us explain these in somewhat more detail.

- (1) Permanent changes versus temporary modifications.

At the height of a disastrous impact, and in the immediate post-impact recovery period, many activities are different from what they had been in the preimpact period.

There is much emergent behavior and groups, the more in catastrophes than in disasters. For example, there will be emergent groups that engage in search and rescue, distribute relief supplies and present grievances of victims about housing and rebuilding (Drabek, 1986: 132-249). Thus, Aguirre and his colleagues (1993) found that the search and rescue in the Guadalajara, Mexico gasoline explosion in 1992, while influenced by informal preimpact social links and ties, was essentially undertaken by emergent groups. However, very few such groups survive in any form. Most simply come into being and then disappear. They are merely temporary social entities with very few of them becoming institutionalized and part of the ongoing social structure. There may be occasional exceptions to this tendency to dissolve, as was true of some citizens groups that crystallized after the Three Mile Island nuclear accident (Walsh, 1984), after the Mexican earthquake of 1985 (Robinson, Franco, Castrejon and Bernard, 1986), and after the Exxon Valdez oil spill (Button, 1992), but these are the rare exceptions.

Apart from emergent groups appearing there are also the temporary modifications of preimpact patterns that occur in formal organizations as a result of disastrous occasions. But such alterations in structure and behavior seldom last beyond the immediate crisis period. Also, while it is typical among officials in the weeks after impact to talk about instituting organizational changes, especially in planning for future occasions, this seldom occurs. For example, a Disaster Research Center (DRC) study of American organizations that looked at them up to five years after impact, found that very few of them established any new structures and/or functions as a result of the crises they underwent (Adams, Stallings and Vargo, 1970; also Ross, 1978).

Likewise, at the community level, temporary modifications are vastly more likely than permanent changes. Rebuilding of destroyed or damaged parts of communities frequently follows the preimpact pattern, that is, what is rebuilt in place is generally the same as before, be this street location, building forms, shopping areas, etc. (this same pattern was observed a half century ago in the rebuilding of bombed cities in Europe after World War II, see Ikle, 1958). It is therefore not surprising that Bates and his colleagues found that in seven Guatemalan communities hit by a rather catastrophic earthquake, 19.5% lived in exactly the same house that they lived in before and 60.8% lived in a different house but located on the same site as their pre-earthquake dwelling, and 14.9% lived in a different house on a different site but in the same village or town where they had resided before the earthquake (Bates, Farrell and Glittenberg, 1979: 128)

A major study in the United States found very little effects of disasters when it looked at a number of community aspects.

We find no discernible effects of either floods, tornadoes, or hurricanes on the changes in population or housing stocks experienced by counties in the period between 1960 and 1970. Additional analyses were also made of the effects...on other characteristics of counties, including housing values, rents, age composition, educational level of population, and family income...In short, there appears to be no firm findings to indicate that natural disasters have any long-lasting effects on counties (Wright, Rossi, Wright and Weber-Burdin, 1979).

In many ways, disasters at least (we discuss catastrophes later) seem to bring about remarkably few permanent changes especially at the organizational level and above. This is in contrast with other kinds of social crises and their consequences. For example, major macro social changes can result from successful revolutions (see Eisenstadt, 1978; Zimmermann, 1983; Skocpol, 1984). Social developments affecting organizations, communities and national level programs and policies also have been observed following recent riots in the United States (Quarantelli, 1993a: 73).

But overall the research picture for disastrous occasions is as Drabek has written:

for most disasters studied--apart from a few cases that appear to have important differentiating qualities--the overall picture is one of...relatively minor, ripples in the long-term development cycle...They are minor, in that continuity, rather than total redirection, emerges (Drabek, 1986: 251).

Put another way, disastrous occasions per se are not major spawning grounds for major new social initiatives or changes. It is not that no change at all ever occurs. Rather it is that apart from temporary modifications, permanent changes are very few and mostly along limited dimensions, as we will now discuss.

(2) Differential effects rather than broad sweeping consequences.

To the extent that social changes occur as a result of disastrous occasions, they tend to be differentiated in their occurrence. That is, a specific organization, some sectors of a community, certain parts of a society may see particular developments that would not otherwise have occurred. But often the imagery, mass media coverage and public discussions about many disasters and

catastrophes implies that all the population and area in the impacted community was a victim. Thus, for example, reference is made to "Mexico City being hit by an earthquake," the "midwest United States was impacted by floods," the "Chernobyl nuclear accident struck the Soviet Union or Russia", etc. This is a very misleading picture, because in these and other disasters, only certain parts of the communities involved were directly impacted.

Also, many immediate effects while seemingly large in absolute terms, often are relatively insignificant when placed in a larger context. For example, as recent studies of the Loma Prieta earthquake and other disasters indicate, overall negative economic consequences were relatively minimal at worst, even though the losses may have been in the billion of dollars.

The data suggest that, at the county level, the quake has had little economic effect. To find drastic, localized effects which are marred by aggregates, one has to look at data for cities or even blocks within cities (Economic, 1992: 147).

Also, as one examination of the effects of disasters on financial markets reported:

The total loss from Hurricane Hugo and the Loma Prieta earthquake combined amounted to under \$10 billion, nine-tenths of which was sustained by homeowners. The value of the equity market in this country is over \$2 trillion. This means that these disasters may have produced a .005 percent change in the capitalized value of corporate America, an insignificant amount to register on the stock market. This is not to say that some corporations, such as insurance carriers and resort companies in South Carolina, were not impacted. But overall, the effects were negligible, particularly in contrast to the wild swings in the New York and Tokyo stock exchanges, which caused nearly \$2 trillion in paper losses combined (Economic, 1992: 104).

It might be objected that this kind of analysis is burying fairly narrowly focused impacts of disastrous occasions in a much wider economic context. But that is the point--while such occasions may directly and heavily impact localized areas, the surrounding context absorbs much of the impact and what may seem absolutely large becomes relatively quite small in the larger world.

In this kind of framework, massive and very broad aftermath changes are not to be expected in typical disasters since not that much of

the preimpact setting is altered. Particular organizations and parts of communities or societal activities may be badly impact and disrupted or destroyed, but overall there may be few overall consequences. At the very least this kind of analysis suggests very strong caution in leaping to conclusions that because large numbers may be involved, they are necessarily significant. It does not follow that there will be much direct effect and that there will be major social change or marked changes in development.

This granted, there can be and are differential effects from disastrous occasions. Thus, some organizational changes occurred after the 1985 Mexican earthquake. The Red Cross and the local metro system changed the disaster preparedness stances of their agencies, as well as establishing new interorganizational ties for planning purposes. In particular a basically new national system of civil protection and a new national level emergency planning, coordinating and managing organization came into being. In addition, mechanisms were institutionalized for strengthening and creating counterpart disaster planning entities at state and local government levels in the country (Quarantelli, 1993c: 34).

A differentiated pattern is also noticeable at the community level. For example, after the Alaskan earthquake, the rebuilding in a number of impacted coastal villages, left them with considerably better ports and facilities than they had before impact. But along most other lines, these communities changed little if any at all.

The Loma Prieta earthquake also, while its consequences were minimal in the larger social context, did have localized community effects. For instance:

The earthquake resulted in a significant decline in the supply of low-cost housing for the poor and for members of various ethnic groups because of the damaging structural impacts in the Oakland area, the area south of Mission Street in San Francisco, and the Tenderloin District (a region with large Indochinese refugee population). The issue of housing for these impacted populations has become an important social and political concern in the Bay area (Economic, 1992: 137).

Occasionally, there are developments at the societal level. There may be changes in laws and legislation which can be attributed to the effect of some particular disastrous occasion. In the United States, national level programs and organizations such as the Federal Emergency Management Agency (FEMA) have been changed in the wake of recent major disasters such as Hurricane Hugo and the Loma Prieta earthquake, and the more catastrophic Hurricane Andrew.

Of course, the more the change is in line with what may already

have been latently present, the more it is likely to occur. For example, in Montserrat in the West Indies, after Hurricane Hugo, three local improvement projects planned before impact were implemented. These included introducing new agricultural production practices, building a community center and improving the potable water distribution system. Originally projected to be carried out on an incremental basis over a ten year period, after the hurricane, the projects were completed over a two year period (Berke, Kartez and Wenger, 1993: 104). Similarly, following an earthquake in Santa Rosa, California in 1986, a preimpact downtown revitalization plan was implemented (Mader, 1980).

(3) Changes are more likely from catastrophes than from disasters.

Although the research evidence is yet not conclusive, it does appear that catastrophes more than disasters are likely to generate social changes at the organizational level and above. This is not to say even catastrophes will always and automatically bring about major changes in the development of a community or society. Although we gave some examples earlier of macro level consequences in certain cases, as a whole historical accounts of past catastrophes do not support such a sweeping statement. In some instances there has been the destruction of total communities such as in several volcanic eruptions like occurred in Pompeii after the eruption of Vesuvius (Etienne, 1992) and in St. Vincent when Pelee erupted (Kennan, 1969). But in all these cases, very few if any permanent effects seemed to have followed elsewhere as a result of what happened to the impacted communities.

There is a literature, especially on developing countries where catastrophic disasters are more likely, which argues that postimpact recovery efforts ought to be directed towards building sustainable development initiatives rather than just restoring the status quo (e.g., Pantelic, 1991). But this literature also recognizes that on the whole, aid and recovery program tend to be oriented to short term relief with little linkage to long term development (Anderson and Woodrow, 1989). Nevertheless, if there are permanent social changes or developments after disastrous occasions, they are far more likely to occur after catastrophes than after disasters. For instance, while there does not appear to be much if any at all outmigration from an area hit by a typical disaster, a portion of the population permanently left St. Croix after catastrophic Hurricane Hugo hit the island (Christian, 1992).

In a major statement, Bates and Peacock have advanced seven likely reasons why developmental changes might be expected. They note that the most important is that catastrophic disasters:

place the structure of the social system under stress and test its capacity to perform vital functions. In the process, weaknesses in the structure of the system are exacerbated and

made visible for all to see. Furthermore, the system is forced to adapt, at least temporarily to this stress and the conditions that cause it. These, at first, temporary adaptations may become permanent features of the social structure or bring about other changes that will be incorporated (1987: 311).

They also note that catastrophic disasters:

differentially affect soci-economic and ethnic groups as well as different sectors of the community's division of labor. As a consequence the stratification system may be affected, and differential decline and growth may occur in various sectors of the social structure...(1987: 312)

In addition, catastrophes may lead to the emergence of new groups as noted earlier in this paper, and provide a setting which fosters new forms of interaction between existing organizations. This too may lead to permanent changes. Also, catastrophic disasters:

frequently destroy or severely damage outmoded infrastructure and force its replacement by more modern technology. Such...innovation may result in the alteration of the stratification system or the division of labor and may result in both differential growth and elaboration of sectors of the system's structure (1987: 312).

At times too, catastrophic disasters often:

result in the influx of a large number of outsiders who supply additional labor and expertise as well as large amounts of outside physical and financial resources. This may produce an economic boom, and provide the impetus for change in both the division of labor and in stratification as well as differential growth and elaboration (1987: 312).

Related to this is that the outside convergers bring with them forms of behavior and relationships that differ from those in the impacted community. These new patterns may be adopted by the local population and become a permanent part of the social structure. On the other hand, the contact may not be positively viewed from the perspective of populations in communities in developing societies, especially if the implication is that the locals are going to have depend on outsiders to survive and recover.

Finally, Bates and Peacock note that:

conflicts often emerge in the aftermath of a [catastrophic disaster] over the distribution of scarce resources and over the equity principle which should guide the reconstruction effort. These conflicts may have serious political implications and result in permanent changes in the relationship between the government and other units comprising the system (1987: 312).

This is illustrated well in the aftermath of the massive avalanche in Yungay, Peru (Oliver-Smith, 1979a).

Now, it has been observed that the permanent changes that can occur will range from the relatively superficial or surface to the most fundamental. For example, the Friuli catastrophe in Italy:

modified the outer-trappings of religious life without altering more deep-seated feeling about religion... [e.g.] fires were lit on hilltops on the twelfth night before Christmas to bring good omens for the next year's crop. Before the quake, virtually all villages between Gemona and Cividale practiced this rite, but now it has nearly disappeared. The feasts of the patron saints that were held annually in every village have also been abandoned (Barbina, 1979: 148).

On the other hand, it was found that an earthquake basically changed the economic division of labor in twelve Guatemalan communities. That is, in the aftermath of the catastrophe, there were compared to the preimpact situation major postimpact changes in patterns of businesses involved in producing agricultural products, clothing, household goods, health, personal services, legal/financial, leisure, farm stock and equipment, information/communication, etc. While there had been a prior tendency toward complexity in the division of labor prior to the earthquake, it was sharply accelerated and most marked in the six communities most heavily impacted. The authors concluded:

The question posited early in this paper was: Does a natural disaster have long-term effects upon community level division of labor? The answer is clearly "Yes". ...The fact that complexity was altered...adds further confirmation to Prince's hypothesis that disasters do produce social change (Hoover and Bates, 1985: 23).

Also, some researchers in the former Yugoslavia have stated that a rebuilt city of Skopje was partly relocated and was twice as large in population and much more prosperous and modern economically than it would have been without its devastating earthquake catastrophe (Musci, 1982). In a more negative way, Oliver-Smith has documented the catastrophic destruction of Yungay, Peru and what happened in the aftermath to the community involved (1979b; 1992).

A case might be made it is in developing countries that social change is more likely. Part of this could stem simply from the fact that catastrophes are more likely to occur in developing than developed societies. But it is also because some of the reasons that Bates and Peacock suggested are more likely to exist in developing systems such as that local victims will be exposed to converging strangers with rather different values and beliefs. This is compounded by the fact that many although not all developing countries tend to be relatively more socially heterogeneous than many developed societies, a point we alluded to earlier as a development feature likely to result in more and worse disastrous occasions in the future.

(4) There are positive as well as negative outcomes.

Disastrous occasions tend to be equated with death, destruction, suffering, losses and all sorts of negative images. Thus, to many the effects of such occasions are automatically seen as being in a totally negative light. However, the consequences of disasters and catastrophes are a matter of empirical determination and should not be an a priori speculative judgement. In that framework, there is clear evidence that there can be positive as well as negative consequences. This is true even in the mental health area. Some victims and families are better off in the long run than they were before impact as a result of undergoing the extreme stress of a major disaster. For example, some have more positive self images and confidence in being able to handle future crises as well as stronger family ties (Drabek and Key, 1984; Quarantelli, 1985)

A Canadian disaster researcher, Scanlon, indicated this point also more generally when he wrote an article that discussed "the winners and the losers" in disastrous occasions. He observes that:

Some persons, families, organizations,  
communities get specific economic benefits as  
a result of disaster (1988: 50).

As one example he cites Seward which was in economic decline before the 1964 Alaskan earthquake. It was devastated by the earthquake, but rebuilt and the preimpact trend was drastically reversed. This is consistent with the observation of Dacy and Kunreuther that:

Communities hit by a natural disaster are  
often rebuilt so they emerge bigger and better

than they were before the event (1969: xi).

Finally, we will conclude this section of the paper with the observation that whether any change is positively or negatively viewed depends considerably on the perspective taken. This is particularly true in the political arena. Oliver-Smith discussing disaster occasions in developing societies notes that they:

can reveal most clearly the existing power relations in a society and the reconstruction process may become an arena of contestation that can put in motion processes affecting predisaster structures of power relations and benefits...Disasters and reconstruction often create openings for the entrance of new groups into the political or economic process, questioning existing power relations, promoting change and simultaneously evoking or mobilizing resistance in sectors supporting status quo arrangements...Such tensions have implications for shifts in political economic power relations in the long term as well as reinterpretations both the structure and process of development (1993: 105).

#### THE FUTURE OF PLANNING FOR DISASTROUS OCCASIONS

So far we have projected a picture of the future that by most criteria would be viewed as negative. But that is neither our intent nor is it a fully accurate projection if left at that. The future with respect to planning for disastrous occasions is not completely bleak. Some of the social changes that are occurring will also positively affect planning in the decades to come. In particular, we want to note some of the implications in the ever increasing importance of the mass media in social life and in the trend towards democratization of political activities. They both encourage and facilitate improvements in disaster planning.

The mass communication systems around the world, particularly as the result of accelerating developments in electronic and computer technologies, have greatly increased their capabilities to quickly produce and distribute information. As a result of technological developments we are moving everywhere into what has been called the "information" type of society (Dordick and Wang, 1993). There are numerous and fundamental consequences from this for every aspect of human life. For our purposes, we want to solely note some of the implications for the disaster and catastrophe area.

For example, the mass media outlets increasingly put disastrous occasions on the agenda of everyone they reach. Information put forth about such occasions is simultaneously exposed to mass audiences in far distant places. Thus, a hurricane in Florida in

the United States will be noted as happening and significant not only by Americans, but also by some in Dacca in Bangladesh, an area also subject to major cyclonic disasters. An earthquake in Armenia will not only be visually exposed to those in that region in the former Soviet Union, but will equally be brought to the attention of audiences in Mexico City, another earthquake prone area.

But it need not even be a disaster experienced in a given area. A Bhopal in India or a Chernobyl in Russia becomes, as a result of media outlet exposure, instantly memorialized all around the world as an important historical happening as well as a symbolic representation of catastrophes that threaten the human race (see Wilkins, 1987) as do in slightly different ways famines as the current one in Somalia or earlier in Ethiopia. This kind of exposure to the content of mass communication systems, given its very dramatic visual presentation, can contribute to the notion that there should be planning for disastrous occasions. Image creating disastrous occasions in particular tend to generate efforts at planning for such crises. Even though distant, officials and communities elsewhere are given striking examples they can use to argue for more local preparedness.

There is every reason to think that mass communication systems will increasingly report on major crises that are distant from their own areas. Modern technologies have enhanced the abilities of local electronic mass media stations to send their own personnel to report directly on disastrous occasions. For example, many television stations from many areas in the United States sent their own reporting teams to transmit live reports back to their local communities after the 1985 Mexico City earthquake.

This kind of mass media information dispersal supports already existing tendencies to improve planning for disastrous occasions. We should note that we are not talking of a static social setting insofar as such planning is concerned. In fact, looking at the historical evolution from the past to the present, one might be encouraged in terms of dealing with future disastrous occasions. The present situation is certainly better than what existed in the past, and as such augurs well for the future.

Our center, the Disaster Research Center, has done considerable research for nearly 30 years on preparations for and responses to natural and technological disastrous occasions. Along some line our recent field studies report rather good news. For example, local emergency management agencies in the United States, have much better planning and managing and have better personnel than they once had (see Wenger, Quarantelli, and Dynes, 1986).

A similar picture can be found if one looks at most countries, developed or developing, around the world. In the last few decades planning for and responding to disastrous occasions has improved. There has been a particular acceleration of the process in European

countries such as Italy, Great Britain, Greece and Spain. Where nothing once existed, much has been created; where there was something in place it has been made better. Almost anywhere that one looks the present as compared with the past is an improvement. Even in developing countries, except perhaps in Sub-Saharan Africa, there has been notable increases in crisis type planning in such societies as India, Mexico, China, Venezuela and Bangladesh.

There is no reason to think that the indicated improvements will not continue to occur. Disastrous occasions will increasingly be on the agenda for attention as the mass communication systems everywhere will find it progressively easier to report on such news stories. While we would not want to suggest that such information dispersal is completely socially functional (a topic which can not be discussed here), without doubt the news stories will contribute positively to existing efforts to improve planning for crises.

In turn, the mass media content about disastrous occasions will continue to converge with another major social trend. As a whole, a social change going on has been a move towards democratization of political activities. This involves changes of many different values, beliefs, activities and practices. For this paper, the two most important have to do with what citizens increasingly expect of their governments and the rise of citizen activism. Both of these will continue to move in the direction that citizens will more and more expect their own governments to protect them against disastrous occasions and/or join with their fellow citizens in efforts towards better planning for environmental threats.

For centuries in many places, populations had little expectation that their governments could or would do much to protect them against the impact of disasters. Partly as a result of religious beliefs as well as a general fatalistic attitude about the vicissitudes of life, "Acts of God" were accepted as inevitable.

But this has changed. Partly as a result of the secularization that has progressively become the dominant mode of thinking in Western thought and also because of certain changes in political beliefs about the role of governments, "fatalism about disasters" has become less and less an acceptable popular view. Especially in the developed world, but spreading rapidly elsewhere:

most citizens accept disaster planning as an appropriate and acceptable function of government...[and] is viewed as a public responsibility (Drabek, 1986: 23).

In fact this author notes that there has been:

some fundamental changes in hazard perceptions. God is losing ground, when it comes to flooding, for example. And if not

God, than man.

While events per se may still be viewed as "Acts of God," it is my belief that greater segments of the public view certain types of damages as avoidable, if government will act (1986: 342, 352).

As other writers have noted:

As humans have come to understand and control natural processes, disasters which were previously viewed as "natural" in that they were beyond human control, are now seen by many as environmental events which can and should be managed.

Currently, many "natural" disasters are not perceived as clearly natural or technological in origin...We suspect that humans will increasingly come to view natural disasters as "unnatural" in origin: people will increasingly assume that humans, and human created systems, are at fault (Blocker, Rochford and Sherkat, 1991: 378, 379-380).

Of course the advent of technological disasters is accelerating the acceptance of this view because to many such dangers are seen as inherently more capable of being controlled by human beings.

That the latter is the case is additionally supported by the emergence in many places of citizen groups interested in environmental threats mostly of a technological nature (such as hazardous wastes, radioactive materials, chemical substances, etc.) From a reactive stance towards the happening of natural disasters, many in this movement have moved to a proactive stance with respect to technological disasters. Thus, both in Europe and the United States, numerous small groups of citizens, usually in an informal way, have formed to better prepare for and respond to chemical and nuclear related hazards which might turn into disastrous occasions. There is every reason to think that such large scale citizen activism will increase in the sense of an increase in both the number of such groups and the range of risks about which they think something should be done. It has been observed by many that there was much social activism generated by the Mexico City earthquake of 1985 (see, e.g., Dynes, Quarantelli and Wenger, 1990).

Overall then, social trends such as greater expectation by citizens that they should be protected against environmental threats as well as particular happenings such as the UN Decade for Natural Disaster Reduction, assure that in almost all societies we can anticipate continuing if not increased attention to planning for disasters and

catastrophes. Overall social changes or developments are contributing to preparing better for disastrous occasions.

Nevertheless, it is rather clear that on balance matters are probably going to get further unbalanced. We are going to be faced with more and worse disastrous occasions in the future no matter how much disaster and emergency preparedness and personnel have or could improve in any realistic sense. If we look not from the past to the present, but from the present to the future, that appears as the inevitable outcome. Such changes as will occur in planning while in the right direction will not be able to match the quantitative and qualitative increases in disastrous occasions, at least if the present level of effort is not increased.

In many ways this is no different from what has been observed of the more general environmental problems that face the world.

The various environmental crises that the world is facing--exhaustion of resources, spoilage, toxicity, and pollution--will grow worse before they grow better. The logic behind this assertion is that the impulse among nations to develop economically and compete with others is so strong that they will give greater priority than impulses to protect the environment. In the short run, environmental considerations constitute a cost and a liability in the drive toward competitive productivity. This effect will no doubt be stronger in those nations struggling to catch up--the former Eastern bloc and the Third World countries--than in the developed nations with developed environmental movements (Smelser, 1991).

Nevertheless, this does not mean nothing can be done. A major first step is to understand the source of the problem for that will also tell us something on what needs to be done. Let us note one general implication of research based observations. It is that solutions are not to be found primarily in new technologies or better use of existing ones. The character and outcomes of future disastrous occasions will primarily stem from social factors. Social issues can only be dealt with socially; improvements in technology can only address technological problems. This is not an argument against the use of technology or its improvement, only that if something is socially problematical, social solutions must primarily be sought.

## References

- Adams, D. R. Stallings and S. Vargo. 1970 Natural disaster and organizational change. Newark, DE.: Disaster Research Center, University of Delaware.
- Aguirre, B., D. Wenger, T. Glass, M. Diaz-Murillo and G. Vito. 1993 The social organization of search and rescue: Evidence from the Guadalajara gasoline explosion. Unpublished paper.
- Anderson, W. 1969. Disaster and Organizational Change: A Study of the Long-Term Consequences in Anchorage of the 1964 Alaska Earthquake. Newark, DE.: Disaster Research Center, University of Delaware.
- Anderson, M. and P. Woodrow. 1989 Rising From the Ashes: Development Strategies in Times of Disaster. Boulder, CO.: Westview Press.
- Auf der Heide, E. 1989 Disaster Response: Principles of Preparation and Coordination. St. Louis, MO.: C. V. Mosby.
- Barbina, Guido. 1979 The Friuli earthquake as an agent of social change in a rural area. Mass Emergencies 4: 145-149.
- Barton, Allen. 1970 Communities in Disasters. Garden City, N.Y.: Anchor.
- Bates, Frederick. 1982 Recovery, Change and Development: A Longitudinal Study of the 1976 Guatemalan Earthquake. Athens, GA.: Department of Sociology, University of Georgia.
- Bates, Frederick and Walter Peacock. 1987 Disasters and social change. Pp. 291-330 in R. Dynes, B. De Marchi and C. Pelanda (eds.) Sociology of Disasters. Milan, Italy: Franco Angeli.
- Bates, Frederick, W. T. Farrell and J. Glittenberg. 1979 Some changes in housing characteristics in Guatemala following the February 1976 earthquake and their implications for future earthquake vulnerability. Mass Emergencies 4: 121-133.
- Baum, David, Raymond Fleming and Laura Davidson. 1983 Natural disaster and technological catastrophe. Environment and Behavior 15: 333-354.
- Bell, Daniel. 1973 The Coming of Postindustrial Society. N.Y.: Basic Books.
- Berke, Philip, J. Kartez and D. Wenger. 1993 Recovery after disaster: Achieving sustainable development, mitigation and equity. Disasters 17: 93-109.

- Berren, M., A. Beigel and S. Ghertner. 1980 A typology for the classification of disasters. Community Mental Health Journal 16: 103-11.
- Blocker, T. Jean, E. Burke Rochford and Darren Sherkat. 1991 Political responses to natural hazards: Social movement participation following a flood disaster. International Journal of Mass Emergencies and Disasters 9: 367-382.
- Bowonder, B., J. Kasperson and R. Kasperson. 1985 Avoiding future Bhopals. Environment 27: 6-13, 31-37.
- Bradford, J., C. Hatcher, R. Zillinskas, S. Wiener, C. Van Zandt, P. Bahnsen and W. Medigovich. 1993 Biological Hazards and Emergency Management. Boulder, CO.: Institute of Behavioral Science, University of Colorado.
- Britton, Neil. 1987 Toward a reconceptualization of disaster for the enhancement of social preparation. Pp. 31-57 in R. Dynes, B. De Marchi and C. Pelanda (eds.) Sociology of Disaster. Milan, Italy: Franco angeli.
- Britton, Neil. 1991 Organisational and Community Response to A Technological Emergency: Case Study of a Major Incident Within a Metropolitan Australian City. Armidale, Australia: Centre for Disaster Management.
- Britton, Neil and John Oliver. 1993 Changing societal hazardousness and increasing social vulnerability: Whose responsibility? Pp. 31-49 in N. Britton and J. Oliver (eds.) Catastrophe Insurance for Tomorrow: Planning for Future Adversities. Australia: Sterling Offices.
- Bruce, James P. 1993 Natural disasters and global change. STOP Disasters 15 (Sept./Oct): 3.
- Button, Gregory. 1992 Social Conflict and Emergent Groups in a Technological Disaster: The Homer Area Community and the Exxon Valdez Oil Spill. Ph. D. dissertation. Department of Anthropology. Brandeis University.
- Carr, Lowell. 1931 Disaster and the sequence-pattern concept of social change. American Journal of Sociology 38: 207-218.
- Christian, Cora. 1992 Hurricane Hugo's Impact on the Virgin Islands Boulder, CO.: Institute of Behavioral Science, University of Colorado.
- Clarke, Lee and James Short. 1993 Social organization and risk: Some current controversies. Annual Review of Sociology 19: 375-399.

- Coburn, A. and R. Spence. 1992 Earthquake Protection. N.Y.: Wiley.
- Cohen, M. 1991 Urban growth and natural hazards. Pp. 93 in A. Kreimer and M. Munasinghe (eds.) Managing Natural Disasters and the Environment. Washington, D.C.: World Bank.
- Crook, S., J. Pakulski and M. Waters. 1992 Postmodernization: Changes in Advanced Society. London: Sage.
- Cuny, Frederick. 1983 Disasters and Development. N.Y.: Oxford.
- Cutter, Susan. 1991 Fleeing from harm: International trends in evacuation from chemical accident. International Journal of Mass Emergencies and Disasters 9: 267-285.
- Dacy, D. and H. Kunreuther. 1969 The Economics of Natural Disasters. N.Y.: The Free Press.
- Dhara, V. R. and D. Kriebel. 1993 An exposure-response method for assessing the long term health effects of the Bhopal gas disaster. Disasters 17: 281-290.
- Dogan, M. and J. Kasarda (eds.) 1988 The Metropolis Era: Mega-Cities. Beverly Hills, CA.: Sage.
- Dombrowsky, Wolf. 1993 Again and again, is a disaster what we call "disaster"?: Some conceptual notes on conceptualizing the object of disaster sociology. Unpublished paper.
- Dordick, H. S. and G. Wang (eds.) 1993 The Information Society. Beverly Hills, CA.: Sage.
- Drabek, Thomas. 1986 Human System Response to Disaster: An Inventory of Sociological Findings. N.Y.: Springer-Verlag.
- Drabek, Thomas. 1989 Disasters as nonroutine social problems. International Journal of Mass Emergencies and Disasters 7: 253-264.
- Drabek, Thomas and Gerard Hoetmer (eds.) 1991 Emergency Management: Principles and Practice for Local Government. Washington, D.C.: ICMA.
- Drabek, Thomas and William Key. 1984 Conquering Disaster: Family Recovery and Long Term Consequences. N.Y.: Irvington.
- Dynes, R. R. 1989 Conceptualizing disasters in ways productive for social science research. Working Paper #80. Newark, DE.: Disaster Research Center, University of Delaware.
- Dynes, R. R. 1992 Disaster reduction: The importance of adequate

assumptions about social organization. Sociological Spectrum 13: 175-192.

Dynes, R. R. and E. L. Quarantelli. 1989 Reconstruction in the context of recovery: Thoughts on the Alaskan earthquake. Preliminary Paper # 141. Newark, DE.: Disaster Research Center, University of Delaware.

Dynes, R. R. and E. L. Quarantelli. 1993 The place of the 1917 explosion in Halifax harbor in the history of disaster research: The work of Samuel H. Prince. Preliminary Paper #189. Newark, DE.: Disaster Research Center, University of Delaware.

Dynes, R. R., B. De Marchi and C. Pelanda (eds.) 1987 Sociology of Disasters. Milan, Italy: Franco Angeli.

Dynes, R. R., E. L. Quarantelli and D. Wenger. 1990 Individual and Organizational Response to the 1985 Earthquake in Mexico City. Newark, DE.: Disaster Research Center, University of Delaware.

1972 Earthquake Related to Reservoir Filling. Washington, D.C.: National Academy of Sciences.

1992 The Economic Consequences of a Catastrophic Earthquake. Washington, D.C.: National Academy Press.

Egginton, Joyce. 1980 The Poisoning of Michigan. N.Y.: Norton.

Eisenstadt, N. 1978 Revolutions and the Transformation of Societies. N.Y.: Free Press.

Endleman, R. 1952 An approach to the study of disaster. Unpublished paper.

Etienne, Robert. 1992 Pompeii: The Day A City Died. N.Y.: Harry Abrams.

1987 FAA, airline industry derelict in implementing available technology to protect its passengers. International Fire Fighter January-February: 7.

Fritz, Charles. 1961 Disasters. Pp. 651-694 in R. Merton and R. Nisbet (eds.) Contemporary Social Problems. N.Y.: Harcourt.

Geipel, Robert. 1991 Long-term Consequences of Disasters: The Reconstruction of Friuli, Italy In Its International Context, 1976-1988. N.Y.: Springer-Verlag.

Gilbert, Claude. 1993 Studying disaster: A review of the main conceptual tools. Unpublished paper.

Gotfried, Robert. 1983 The Black Death: Natural and Human

Disaster in Medieval Europe. N.Y.: Free Press.

Hagan, Richard. 1993 Let's look at Texas' hurricane history. Division of Emergency Management Digest 39: 12-13, 21.

Hamilton, D. and R. Meechan. 1971 Ground rupture in the Baldwin Hills. Science 172: 333-344.

Harrison, D. 1988 The Sociology of Modernization and Development. London: Unwin-Hyman.

Herring, Susan. 1989 From the Titanic To the Challenger: An Annotated Bibliography on Technological Failures of the Twentieth Century. N.Y.: Garland.

Hewitt, Kenneth. (ed) 1983 Interpretations of Calamity. Boston: Allen and Unwin.

Hoover, G. and F. Bates. 1985 The impact of a natural disaster on the division of labor in twelve Guatemalan communities: A study of social change in a developing country. International Journal of Mass Emergencies and Disasters 3: 9-26.

Horlick-Jones, Tom. 1993 Modern disasters as outrage and betrayal. Unpublished paper.

Hughes, Mary Ann. 1992 An Annotated Bibliography and Listing of the Social Science Literature on Planning For and Responding to Hazardous Materials Disasters. Newark, DE.: Disaster Research Center, University of Delaware.

Huppert, George. 1986 After the Black Death: A Social History of Early Modern Europe. Bloomington, IN.: Indiana University Press.

Ikle, Fred. 1958 The Social Impact of Bomb Destruction. Norman, OK.: University of Oklahoma Press.

1989 Japanese fear of a major quake in their country would have devastating impact on the global economy. Earthquake Update 1 :1.

1992 Joint Climate Project To Address Decision Makers' Uncertainties. Washington, D.C.: Science and Policy Associates.

Jones, Barclay. 1992 Population growth, urbanization, disaster risk and vulnerability in metropolitan areas: A conceptual framework. Pp. 51-76 in Alcira Kreimer and Mohan Munasinghe (eds.) Environmental Management and Urban Vulnerabilities. Washington, D.C.: The World Bank.

Kasarda, John and Edward Crenshaw. 1991 Third world urbanization: Dimensions, theories and determinants. Unpublished paper.

- Kennan, George. 1969 The Tragedy of Pelee. N.Y.: Negro Universities Press.
- Kinston, Warren and Rachel Rosser. 1974 Disaster: Effects on mental and physical state. Journal of Psychosomatic Research 18: 437-456.
- Kreps, Gary. 1985 Disasters and the social order. Sociological Theory 3: 49-65.
- Kreps, Gary. (ed.) 1989 Social Structure and Disaster. Newark, DE.: University of Delaware Press.
- Kreps, Gary. 1991a Organizing for emergency management. Pp. 30-54 in T.Drabek and G. Hoetmer (eds.) Emergency Management: Principles and Practice for Local Government. Washington, D.C.: International City Management Association.
- Kreps, Gary. (eds.) 1991b Social Structure and Disaster. Newark, DE.: University of Delaware Press.
- Kreps, Gary. 1993 Disaster as systemic event and social catalyst: A clarification of subject matter. Unpublished paper.
- Kroll-Smith, J. Stephen and Stephen Couch. 1991 What is a disaster? An ecological-symbolic approach to resolving the definitional debate. International Journal of Mass Emergencies and Disasters 9: 355-366.
- Kueneman, R. and J. Wright. 1976 News policies of broadcast stations for civil disturbances and disasters. Journalism Quarterly 53: 670-677.
- Lagadec, Patrick. 1982 Major Technological Risks. Oxford, England: Pergamon.
- Lagadec, Patrick. 1990 States of Emergency Technological Failures and Social Destabilization. London: Butterworth-Heinemann.
- Lee, Leonard. 1992 Making the connections. Disaster Recovery 5: 8-9.
- Lenski, G., J. Lenski and P. Nolan. 1991 Human Societies: An Introduction to Macrosociology. N.Y.: McGraw Hill.
- Lieven, Anatol. 1988 Alps study blames disasters on humans. The Times March 30: 11.
- 1993 Local mitigation comes of age. Tulsa tells its story. ASFPA News and Views 6: 1-2.

Mader, G. 1980 Land Use Planning After Earthquakes. Portola Valley, CA.: William Spangle and Associates.

McDonald, John. 1989 Statement of John C. McDonald before the Committee on Governmental Affairs, United States Senate. Unpublished paper.

Medvedev, Zhores. 1979 Nuclear Disaster in the Urals. N.Y.: Norton.

Meshkati, M. 1991 Human factors in large-scale technological systems' accidents: Three Mile Island, Bhopal, Chernobyl. Industrial Crisis Quarterly 5: 133-154.

Meyers, Barton. 1991 Disaster study of war. Disasters 15: 318-330.

Minnis, Paul. 1985 Social Adaptation to Food Stress: A Prehistoric Southwestern Example. Chicago: University of Chicago Press.

Moore, Harry. 1956 Toward a theory of disaster. American Sociological Review 21: 734-737.

Monroe, Scott. 1992 Chelyabinsk: The evolution of disaster. Post-Geography 33: 533-545.

Moseley, Michael. 1992 The Incas and Their Ancestors: The Archeology of Peru. N.Y.: Thames and Hudson.

Musci, V. 1982 Spatial and urban planning and development in earthquake prone areas. Pp. 299-306 in B. Jones and M. Tomazevic (eds.) Social and Economic Aspects of Earthquakes. Ithaca, N.Y.: Program in Urban and Regional Studies, Cornell University.

Mushtaque, A., R. Chowdhury, A. Bhuyia, A. Choudhury and R. Sen. 1993 The Bangladesh Cyclone of 1991: Why so many people died. Disasters 17: 291-303.

Nigg, Joanne. 1993 Disaster recovery: A social process. Pp. 258-269 in Proceedings of the United States-Former Soviet Union Seminar on Social Science Research On Mitigation For and Recovery From Disasters and Large Scale Hazards. Newark, DE.: Disaster Research Center, University of Delaware.

Nigg, Joanne and Kathleen Tierney. 1993 Disasters and social change: Consequences for community construct and affect. Unpublished paper.

Oliver, J. and N. Britton. 1993 Introduction: The recognition and the problems of change. Pp. 1-10 in N. Britton and J. Oliver (eds.) Catastrophe Insurance for tomorrow: Planning for Future

Adversities. Australia: Sterling Offices.

Oliver-Smith, Anthony. 1979a Post-disaster consensus and conflict in a traditional society: The avalanche of Yungay, Peru. Mass Emergencies 4: 39-52.

Oliver-Smith, Anthony. 1979b The Yungay avalanche of 1970: Anthropological perspectives on disaster and social change. Mass Emergencies 4: 39-52.

Oliver-Smith, Anthony. 1982 Here there is life: The social and cultural dynamics of successful resistance to resettlement in post-disaster Peru. In A. Hansen and A. Oliver-Smith (eds.) Involuntary Migration and Resettlement: The Problems and Responses of Dislocated People. Boulder, CO.: Westview.

Oliver-Smith, Anthony. 1992 The Martyred City: Death and Rebirth in the Peruvian Andes. Prospect Heights, IL.: Waveland Press.

Oliver-Smith, Anthony. 1993 Anthropological perspective in disaster research. Pp. 94-117 in E. L. Quarantelli and K. Popov (eds) Proceedings of the United States-Former Soviet Union Seminar on Social Science Research on Mitigation For and Recovery From Disasters and Large Scale Hazards. Volume I: The American Participation. Newark, DE.: Disaster Research Center, University of Delaware.

Pantelic, J. 1991 The link between reconstruction and development. In A. Kreimer and M. Munasinghe (eds) Managing Natural Disasters and the Environment. Washington, D.C.: World Bank.

Passell, Peter. 1993 Flood control errors were made. The issue is how to undo them. New York Times July 29, 1993: D2.

Pauchant, T., I. Mitroff, D. Weldon and G. Ventolo. 1990 The ever expanding scope of industrial crises: A systematic study of the Hinsdale telecommunication outage. Industrial Crisis Quarterly 4: 243-261.

Pelanda, Carlo. 1982 Disaster and order: Theoretical problems in disaster research. Newark, DE.: Disaster Research Center, University of Delaware.

Perrow, Charles. 1984 Normal Accidents: Living With High Risk Technologies. N.Y.: Basic Books.

Perrow, Charles. 1991 A society of organizations. Theory and Society 20: 725-762.

Petterson, John. 1988 The reality of perception: Demonstrable effects of perceived risk in Goiania, Brazil. Practicing

Anthropology 10: 3-4, 8-9, 12.

1990 Physical Vulnerability of Electric Systems to Natural Disasters and Sabotage. Washington, D.C.: U.S. Government Printing Office.

Porfiriev, Boris. 1992 Policy responses to large scale accidents in the Soviet Union. International Journal of Mass Emergencies and Disasters 10: 179-188.

Postel, Sandra. 1989 Waters for Agriculture, Facing the Limits. Washington, D.C.: World Watch Institute.

Prince, Samuel. 1920 Catastrophe and Social Change. Based Upon A Sociological Study of the Halifax Disaster. N.Y.: Columbia University Press.

Quarantelli, E. L. 1982 What is a disaster? The need for clarification and conceptualization in research. Pp. 41-73 in B. Sowder (ed.) Disasters and Mental Health: Selected Contemporary Perspectives. Washington, D.C.: U.S. Government Printing Office.

Quarantelli, E. L. 1983 Delivery of Emergency Medical Services in Disasters: Assumptions and Realities. Newark, DE.: Disaster Research Center, University of Delaware.

Quarantelli, E. L. 1984 Emergent Behavior at the Emergency Time Periods of Disasters. Newark, DE.: Disaster Research Center, University of Delaware.

Quarantelli, E. L. 1985a An assessment of conflicting views on mental health: The consequences of traumatic events. Pp. 173-215 in Charles R. Figley (ed.) Trauma and Its Wake: The Treatment of Post-Traumatic Stress Disorder. N.Y.: Brunner/Mazel.

Quarantelli, E. L. 1985b Emergent Citizen Groups in Disaster Preparedness and Recovery Activities: Final Report. Newark, DE.: Disaster Research Center, University of Delaware.

Quarantelli, E. L. 1987 What should we study: Questions and suggestions for researchers about the concept of disasters. International Journal of Mass Emergencies and Disasters 5: 7-32.

Quarantelli, E. L. 1988 Disaster crisis management: A summary of research findings. Journal of Management Studies 25: 373-385.

Quarantelli, E. L. Disaster response: Generic or agent-specific? 1991 Pp. 97-105 in A. Kreimer and M. Munasinghe (eds.) Managing Natural Disasters and the Environment. Washington, D.C.: World Bank.

Quarantelli, E. L. 1992a Urban vulnerability and technological

hazards in developing societies. Pp. 187-236 in A. Kreimer and M. Munasinghe (eds.) Environmental Management and Urban Vulnerability. Washington, D.C.: World Bank.

Quarantelli, E. L. 1992b Can and should social science disaster research knowledge and findings from developed societies be applied in developing societies. Asia-Pacific Journal of Rural Development 2: 1-14.

Quarantelli, E. L. 1992c Future disasters and planning for them: The effects of current social change trends. Newark, Delaware: Disaster Research Center, University of Delaware.

Quarantelli, E. L. 1993a Community crises: An exploratory comparison of the characteristics and consequences of disasters and riots. Journal of Contingencies and Crisis Management 1: 67-68.

Quarantelli, E. L. 1993b The environmental disasters of the future will be more and worse but the prospect is not hopeless. Disaster Prevention and Management 2: 11-25.

Quarantelli, E. L. 1993c Organizational response to the Mexico City earthquake of 1985: Characteristics and implications. Natural Hazards 8: 19-38.

Quarantelli, E. L., D. Wenger, S. Mikami and O. Hiroi. 1993 The Reporting of News in Disasters: A Comparative Study of Japanese and American Communities. Newark, DE.: Disaster Research Center, University of Delaware.

Quinn, P. 1993 Athens faces water-supply collapse. Philadelphia Inquirer November 25.

Ramasubramanian, K., S. Mitra, and M. Bandopadhyay. 1987 Some consideration of disaster planning in Indian context. Pp. 183-187 in Proceedings of the World Conference on Chemical Accidents. Rome, Italy: Istituto Superiore di Sanita.

Reich, Michael. 1991 Toxic Politics: Responding to Chemical Disasters. Ithaca, N. Y.: Cornell University Press.

Robinson, S., Y. Franco, R. Castrejon and H. Bernard. 1986 It shook again: The Mexico City earthquake of 1985. In A. Oliver-Smith (ed.) Natural Disasters and Cultural Responses. Williamsburg, VA.: College of William and Mary.

Rochford, E. and T. Jean Blocker. 1991 Coping with "natural" hazards as stressors: The predictors of activism in a flood disaster. Environment and Behavior 23: 171-194.

Ross, G. A. 1978 Organizational innovation in disaster settings. Pp. 215-232 in E. L. Quarantelli (ed.) Disasters: Theory

and Research. Beverly Hills, CA.: Sage.

Rossi, P., J. Wright, S. Wright and E. Weber-Burdin. 1978 Are there long term effects of American natural disasters? Mass Emergencies 3: 117-132.

Rubin, Claire, M. Saperstein and D. Barbee. 1985 Community Recovery From a Natural Disaster. Boulder, CO.: Institute of Behavioral Science, University of Colorado.

1934 Safety at sea--Hardwon lessons applied. New York Times September 16: Section XX: 1.

Scanlon, Joseph. 1988 Winners and losers: Some thoughts about the political economy of disaster. International Journal of Mass Emergencies and Disasters 6: 47-63.

Schmeck, Harold. 1987 Panels discounts special hazards in gene splicing. New York Times August 15: p. 1-7.

Schorr, John. 1987 Some contributions of German Katastophensoziologie can make to the sociology of disaster. International Journal of Mass Emergencies and Disasters 5: 115-135

Shargorodsky, S. 1993 A lethal Soviet legacy. Wilmington News Journal December 24: 2.

Sheets, P. D. 1979 Environmental and cultural effects of the Ilopango eruption in Central America. In P. D. Sheets and D. K. Grayson (eds.) Volcanic Activity and Human Ecology. N.Y.: Academic Press.

Skocpol, Theda. 1984 States and Social Revolution: A Comparative Analysis of France, Russia and China. Cambridge, MA.: Cambridge University Press.

Slovic, Paul. 1987 Perception of risk. Science 236: 280-285.

Smelser, Neil. 1991 The social sciences in a changing world society. American Behavioral Scientist 34: 518-529.

Smelser, Neil. 1994 Sociology. Cambridge, MA.: Blackwell.

Solomon, Kenneth. 1988 Sources of radioactivity in the ocean environment: From low level waste to nuclear powered submarines. Journal of Hazardous Materials 18: 255-262.

Stallings, R. 1987 Organizational change and the sociology of disaster. Pp. 239-258 in R. R. Dynes, B. De Marchi and C. Pelanda (eds.) Sociology of Disasters. Milan, Italy: Franco Angeli.

Stallings, Re. 1988 Conflict in natural disaster: A codification

of consensus and conflict theories. Social Science Quarterly 69: 569-586.

Stoddard, Ellewyn. 1968 Conceptual Models of Human Behavior in Disasters. El Paso, TX.: Texas Western Press.

Sullivan, James D. 1993 A report card on the effectiveness of emergency management and engineering. Unpublished paper.

Sztompka, Piotr. 1993 The Sociology of Social Change. Cambridge, MA.: Cambridge University Press.

Wald, Matthew. 1993 Rusting uranium in storage pools is troubling U.S. New York Times, December 8: 1.

Walsh, E. 1984 Local community vs. national industry: The TMI and Santa Barbara protests compared. International Journal of Mass Emergencies and Disasters 2: 147-163.

Weiss, Bernard and Thomas Clarkson. 1986 Toxic chemical disasters and the implications of Bhopal for technology transfer. The Milbank Quarterly 64: 216-236.

Wenger, Dennis, E. L. Quarantelli and Russell Dynes. 1986 Disaster Analysis: Emergency Management Offices and Arrangements. Newark, DE.: Disaster Research Center, University of Delaware.

Westgate, Kenneth and O'Keefe. 1976 Some Definitions of a Disaster. Bradford, England: Disaster Research Unit, University of Bradford.

Whitney, Craig. 1993 Rhine floods worse in century: 50,000 homeless. New York Times December 25: 4.

Wijkman, Anders and Lloyd Timberlake. 1984 Natural Disasters--Acts of God or Acts of Man?. London: Earthscan.

Wilkins, Lee. 1986 Media coverage of the Bhopal disaster: A cultural myth in the making. International Journal of Mass Emergencies and Disasters 4: 7-33.

Wilkins, Lee. 1987 Shared Vulnerability: The Mass Media and American Perception of the Bhopal Disaster. Westport, CT.: Greenwood Press.

Williams, Marcia. 1991 Strategies for managing present and future wastes. Risk Analysis 11: 75-85.

Wright, Joseph. 1978 Organizational prestige and task saliency in disaster. Pp. 199-213 in E. L. Quarantelli (ed.) Disasters: Theory and Research. Beverly Hills, CA.: Sage.

Wright, J., P. Rossi, S. Wright and E. Weber-Burdin. 1979 After the Clean-Up: Long-Range Effects of Natural Disasters. Beverly Hills, CA.: Sage.

Zaman, M. Q. 1989 The social and political context of adjustment to riverbank erosion hazard and population resettlement in Bangladesh. Human Organization 48: 196-205.

Zaman, M. Q. 1991 The displaced poor and resettlement policies in Bangladesh. Disasters 15: 117-125.

Ziegler, Philip. 1969 The Black Death. N.Y.: John Day.

Zimmermann, Ekkart. 1983 Political Violence, Crises and Revolutions: Theories and Research. Boston, MA.: G. K. Hall Co.