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E. L. Quarantelli

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Implications for Programmes and Policies From Future Disaster Trends[1]

E. L. Quarantelli[2]

It is all but certain that there will be more and worse disasters in the future. Other researchers as well as ourself have detailed and documented this elsewhere. This undesirable outcome will result from the last stages of two master and worldwide social trends: industrialisation and urbanisation. However, crisis planning and emergency managing policies can be established and steps can be taken that will reduce and weaken some of the negative effects of the disasters of the twenty-first century. Among major ones are: I. Noting and accepting the fact that all disasters are essentially social occasions that initially and primarily have to be dealt with by social means; II. Dropping the distinction in planning between natural and technological disasters and moving to an all-hazard or generic approach; III. Making disaster mitigation at least as much a priority in planning and application as emergency preparedness, response and recovery; IV. More closely integrating disaster planning to the developmental planning or social change processes of the social system involved; and V. Ascertaining in what ways disaster problems are similar to and different from other environmental problems, and concurrently addressing both where there are similarities. If the right policies and measures are put in place, the future will not be the past revisited nor will it be only the present repeated.

Keywords: Disasters; social change; emergency planning; crisis management; social trends

Introduction

We have detailed and documented elsewhere that on the global scene we are inevitably faced with more and worse disasters in the future.[3] Irrespective of whether the involved agents are natural or technological, there will be both quantitative and qualitative increases in disastrous occasions for all societies. This will result from two master social trends — *industrialisation* and *urbanisation* — inherent in the very dynamics of societal life anywhere, although currently more prominent in developing countries. The first tendency insures that disastrous agents and occasions will increase. The second trend is raising the risks and vulnerabilities of possibly impacted populations and societies. Industry, with its accompanying distinctive kind of technology, is spreading everywhere. For example, while in 1888 the five most highly industrialised 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.[4] This trend has been paralleled by an ever-swelling involvement of populations in an urban way of life concentrated in constantly enlarging

metropolitan areas. By the year 2010, there will be 511 cities exceeding a million inhabitants each and for the first time the majority of the world's population (51.8%) will be urban; fifteen years later, there will be 639 metropolises of over a million persons.[5]

As the world continues to industrialise and urbanise, it is continually creating conditions for more and worse disasters that, among other things, will contribute further to environmental degradation and hinder developmental programmes. The last stages of the industrialisation and urbanisation processes, however positive in effects along many lines, will both increase the number of potential disaster agents and enlarge the vulnerabilities of communities and populations at risk.

Making for an increase are: (i) the accelerating expansion of accidents and mishaps in the chemical and nuclear areas; (ii) technological advances that reduce some hazards but make some old threats more dangerous; (iii) new versions of old and past dangers such as urban droughts; (iv) the emergence of innovative kinds of technologies such as computers and biogenetics that present distinctively new dangers; and, (v) an increase in multiple (eg, natural disasters creating technological ones) or synergistic-type disasters resulting in more severe environmental consequences.[6]

Increasing the vulnerabilities are that: (i) both natural and technological disaster agents will have more built-up areas to impact; (ii) more vulnerable kinds of populations will be affected than in the past; (iii) metropolitan areas will be increasingly impacted, and along certain lines the social organisations and group configurations of urban areas are not particularly well suited for coping with disasters; (iv) increasing numbers of localities will have disastrous conditions from sources that may be quite distant and even from the past; and (v) certain future disasters have catastrophic potential although they may produce neither casualties nor do much property damage.[7]

We primarily discuss 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, explosions, volcanic eruptions, structural failures, tornadoes, transportation wrecks and crashes, avalanches, etc). Our observations have to be selectively qualified as to their applicability for those kinds of crises that entail usually slow-moving and/or very diffuse agents such as are involved in social threat situations like famines, droughts, epidemics, toxic poisonings through hazardous wastes, and air and water pollution episodes, etc. Some comments will also be applicable, but less so, for different kinds of crises, especially the ones involving social conflicts such as in wars, revolutions, riots, terrorist attacks, acts of sabotage, product tampering, and similar hostile happenings.[8]

Policies and actions for the future

Policies can be established and steps can be taken that will reduce and weaken some negative effects of the disasters of the future. Let us present five major ways in which improvements can be made. The following normative statements have to do both with policies and means.

1. There is a need not only to note but to accept the fact that since all disasters are initially and essentially social occasions, planning for them has to be primarily by social means.

A major first step for doing anything is to understand the sources of problems, for that will

also tell us something about what needs to be done. The character of future disastrous occasions will stem from social factors. It certainly should be clear from our remarks that the more numerous and worse disastrous occasions of the future must be primarily attributed to changes or trends in human or social happenings rather than in meteorological or geophysical conditions or happenings per se.

Thus, the greater vulnerability of the aged to future disasters and catastrophes in developed countries is partly attributable to where they live: for example, the fact that in the United States retired people increasingly live in mobile or trailer home parks in flood plains, hurricane-prone and flash flood areas. Likewise, the increasing risk to young populations in developing countries to typhoons, earthquakes, and landslides is partly attributable to the large number of homeless and very poor rural migrants flocking to and residing in more hazardous zones of metropolitan complexes such as Lima, Calcutta, Lagos, Cairo, and Rio de Janeiro. If so, it follows that solutions are to be sought primarily in the social arena.

This general point is consistent with the view of social science researchers that all disasters are primarily the results of human actions. A disaster is not a physical happening. It is a social occasion. Thus, it is a misnomer to talk about *natural* disasters as if they could exist outside of the actions and decisions of human beings and their societies (interestingly this is always recognised in the case of technological disasters). For instance, floods, earthquakes, and other so-called 'natural' disaster agents have social consequences *only* because of the activities of the communities involved, before, during and after the impact of the disaster. Allowing high-density population concentrations in flood plains, having poor or unenforced earthquake building codes for structures, delaying evacuation from volcanic slopes, providing inadequate information or warnings about tsunamis, for example, are far more important than the disaster agent itself in creating the casualties, property and economic losses, psychological stresses, and disruptions of everyday routines that are the essence of disasters.

This granted, the point is that if something is socially problematical, social solutions must primarily be sought. Sometimes in disaster planning an argument is made, for instance, for the need for more radio equipment to improve communication. Yet studies have consistently shown that good information flow, for example, is mostly dependent on consensus regarding who plays what roles, accepted legitimacy for decision making, social mechanisms for facilitating co-ordination, pre-impact interaction among officials who are most likely to be involved in crises, etc, rather than an increase or improvement in the mechanical means used for communicating.[9]

As another example, longer-run problems can be addressed by instituting such measures as stronger building codes, more appropriate land use management, educational programmes on safeguards against risks, as well as other hazard and disaster mitigation actions, especially of a non-structural nature. At a more contextual level, there is a need to take into account what influences internal mitigation patterns, the social values attached to places of residence, and economic incentives. The negative effects of disastrous occasions can be weakened if hazardous agents are reduced and populations are made less vulnerable. Conscious and deliberate policies and programmes can affect the latter contextual conditions as well as the former immediate ones that have consequences for disasters.

Apart from its negative contribution to potentially increasing the number of disaster agents, technology can positively facilitate the social solutions in some cases. Geographic information systems are a good example of something that can contribute to better decision making and risk assessment. As an international disaster relief expert recently noted:

> New technologies are useful . . . although their relevance may vary according to the type of disasters. In the anticipative phase: remote-sensing and satellite imagery for land use planning, monitoring of droughts and crops, hasard mapping, identification of secondary hasards, modeling for forest fires or spread of floods, simulation exercises for decision-making and preparedness of the public, computer databases of resources and expertise. Before an impending disaster: tracking of cyclones, monitoring of floods and volcanic eruptions, early warning for storms. In the relief and rescue phases: communications for search and rescue, surveys of destroyed areas, assessment of damages, monitoring of external assistance.[10]

Now, technological developments relevant to the disaster area continue apace if not at an increasing rate. There are many positive outcomes of such innovations. Nevertheless, like all technology, something can and will go wrong.[11] This cannot be eliminated, for, as has been written:

> The impact of human fallibility and malice on hasardous, essential, and highly engineered systems is not at root an engineering problem but a people problem. It arises because the world is peopled by human beings rather than by angels and robots. Whether the resulting failures can be kept small enough without an undesirable degree of social engineering — whether the degree of control required to protect fragile technical systems is acceptable in a free society — is a profound political issue.[12]

In addition, such problems are not static but evolve as societies evolve. Even two decades ago some said that it was plausible that:

> fallibility problems . . . [will] become more prominent as [vulnerable systems] . . . proliferate, salesmen outrun engineers, investment conquers caution, routine dulls commitment, boredom replaces novelty, and less skilled technicians take over especially in countries with little technical infrastructure or tradition.[13]

This is not an argument against the use of any kind of technology for disaster planning purposes. However, no technology can be any better than the social infrastructure that uses it. Those who would use it must use it correctly, and that will not always be the case.

II. There is a need to drop the distinction in planning between natural and technological disasters and to move to an all-hazard or generic approach.

The growing mergers and links between natural and technological disasters reinforce our belief that a distinction that was never valid in the first place should now be discarded. Disaster theorists who argue that *all* disastrous occasions are attributable to human and group actions, usually see no meaningful conceptual distinction between 'natural' and 'technological' disasters.[14]As such, the argument is that for planning and managing purposes it is *not* useful to approach disasters in agent-specific terms, eg, as a cyclone, a toxic gas leak, a radiation fallout, a flood, etc. Instead, it is more valid to approach all disasters as having important common elements and to emphasise those across-the-board features. Increasingly, this all-hazard or generic view of disasters is coming to the fore.

There are two general reasons for this shift to a generic approach. One is theoretical, the other is empirical. From a theoretical point of view there has been a shift away from a focus on the physical aspects involved toward a more social conception of disasters. This has partly resulted from a logical recognition that, for instance, the occurrence of an earthquake or a chemical explosion as such does not automatically result in a 'disaster'. Thus, a natural land movement of a certain kind is an earthquake and the transformation of an inert liquid into an expansive

gas is a chemical explosion. Yet unless there are significant negative social consequences, such happenings remain only a geophysical event or a chemical process (eg, an earthquake in uninhabited land or a chemical explosion caught within a safety container), what geographers see as hazards.

From this perspective, a disaster can be identified *only* in terms of some features of a social occasion, that is, some behavioural characteristics of the individuals and groups reacting in the situation. The socially-oriented conception of a disaster forces a focus on the common or similar properties of the social happening and away from the physical features of natural and technological agents and impacts.

Even more critically crucial for this issue is the fact that cumulative social science studies have found that sociobehavioural features of disasters are not generally agent specific, but are manifested across many different types of natural and technological agents.[15] For very many human and organisational problems the specific kind of agent that might be involved does not matter. Whether the emergency time task is warning, evacuation, sheltering, feeding, search and rescue, disposal of the dead, mobilisation of resources, communication flow, interorganisational co-ordination, public information, etc, and whether the tasks involve individuals or groups, the same general activities have to be undertaken irrespective of the specific agent in the situation.

For example, the same kind of warning messages and the same kind of warning system are needed and are effective in getting people to evacuate, irrespective of the specific agent involved. It does not matter if the agent is a volcanic eruption, an oil spill, a tsunami or a major fire in a hazard waste site — what will motivate people to give credence to warning messages, what kinds of warning information will be effective, what will limit the acceptance of a warning, etc, will be the same in all cases. These human aspects of a disaster do not depend on the specific type of agent involved. The same is true with respect to organisational-level responses.[16]

It is no different with regard to mitigation or prevention planning. For example, the same kinds of bureaucratic arguments advanced for a physical solution to potential disaster problems, the social sources of support and resistance in the governmental and private sector to such measures, citizen views of the legitimacy and acceptability of suggested planning, and willingness to put preventive measures on a political agenda, show considerable similarity irrespective of the particular disaster agent involved. Thus, what researchers have found about the non-technical difficulties in implementing earthquake mitigation measures are similar to the problems involved in instituting hazard chemical disaster prevention measures. Put another way, most human, group, organisational, community and societal aspects of mitigation planning, are generic rather than disaster agent specific.

In addition, apart from theoretical, logical or empirical research reasons for taking a generic or all-hazard approach to disaster planning, there are also practical ones. These include being: (i) cost-efficient in terms of expenditure of time, effort, money and resources; (ii) a politically better strategy in that it mobilises a wider range of groups interested in disaster planning, thus creating a more powerful constituency for the process; (iii) a major way of avoiding duplication, conflict, overlaps, and gaps in planning and managing disasters; and (iv) a way of increasing efficiency as well as effectiveness in any effort to cope with disastrous occasions. These points should be taken seriously in the sense that they ought to guide policies and programmes.

Of course, vested interests in both the public and private sectors focused on one kind of agent, earthquakes or chemical hazards for instance, do not see it that way and act as major barriers

to adopting an approach that cuts across specific agents. In fact, groups may compete with one another for resources and advance claims that their particular agent should be given higher priority in the political arena. Stallings[17] recently has documented how in the United States those interested in earthquakes, be they engineers or emergency managers, have been able to obtain higher priority for their agendas than those concerned with other disasters.

III. There is a need to make disaster mitigation as much of a priority in planning and application as emergency preparedness, response and recovery.

Our view is that the basic sources for disastrous occasions are to be found in the basic social structures and social processes of societies. If this is the case, it suggests that ameliorative and preventive measures should be attempted in those dimensions. This, in turn, means that greater emphasis needs to be placed on mitigation programmes and policies.

The term 'mitigation' is used in a variety of ways in the planning for and managing of disasters, sometimes unfortunately being equated only with structural measures such as the construction of dams. While such engineering feats may be part of structural mitigation, even within that category are included such other measures as construction and building codes, design standards, retrofitting, housing inspections, flood proofing, etc and the implementation and enforcement of all measures through, for instance, the certification of building inspectors. Equally if not more important are other mitigation activities such as legislative and regulatory measures, including developmental and redevelopmental policies and programmes (eg, land use management, density reduction, setback regulations, zoning, relocation, etc); plus economic measures such as insurance and financial and taxing incentives; and educational measures including training and educational programmes (for professionals such as architects, city planners, mass media personnel as well as citizens). Last but not least, mitigation involves some measures taken during the short-run preparedness, relief and recovery phases of disasters that indirectly contribute to mitigation.

To argue for giving more priority to mitigation is not to downplay the necessity of actually improving disaster preparedness, response and recovery planning. Mitigation should *never* aim at replacing such measures as more effective warning systems, better management of evacuations, or quicker and more effective integration of relief and recovery activities by multiple organisations. Instead, mitigation should be seen as an addition to the other kinds of disaster planning. Normally one does not stop trying to alleviate or prevent immediate symptoms of pain and suffering in an ill person because there is an intent to perform an operation or give a drug treatment that in the long run will eliminate or change the basic conditions responsible for the illness. The same general principle is applicable here — other disaster planning should not be stopped because mitigation planning is given greater attention.

Of course mitigation will never prevent all disasters, or even most. Yet, especially in developing countries, as already has happened in developed societies, such planning could particularly and significantly reduce casualty tolls and weaken psychological stresses and social disruptions that result from disasters. While some reduction of economic losses might be anticipated in ordinary or typical disasters, it is possible there will be less effect on such losses from catastrophic ones.[18]

IV. There is a need to more closely integrate disaster planning to the developmental planning or social change processes of the social system involved.

We have stressed that the disasters of the future especially will stem from the social changes

that are going on in social systems. Again, if true, it suggests a point of attack. This is that disaster planning should be linked to both societal and community level developmental planning.

Mitigation lends itself somewhat better to linkages with non-disaster kinds of planning than other kinds of disaster planning. As noted, a wide variety of measures can be used to support and implement effective mitigation. Many of them already exist in the activities that communities pursue on a day-to-day basis, without even a post-impact disaster environment. This is an important point because it is saying that mitigation is often already latently embedded in those activities that are routinely undertaken in the typical community in developing societies (oddly, this seems to be less recognised in developed societies such as in the United States, where much mitigatory activity is linked to emergency organisations and personnel rather than to planning and development agencies).

A fundamental weakness of much of the contemporary approach to disaster planning is the separation from everyday decision making about community development.[19] There should be no sharp boundary between routine village, regional and national developmental planning and disaster planning. Every decision about residential land use, plant siting, and indeed every industrial and economic policy or programme, carries with it some consequence for risk and hazard. As a result, every decision increases or decreases the potential for a disaster. If the effects of natural and technological disasters are to be reduced, than the risk implicit in everyday routine planning must be given greater explicit recognition by every level of government as well as the private sector at all stages of planning and decision making. In essence, the most effective way to reduce the impact of disaster is to incorporate or integrate hazard assessment and disaster planning into the process of community project formulations and development planning, and their implementation. Or, as two disaster researchers have recently written:

> It is important to realise that the post-disaster 'recovery process' is one in which an underdeveloped system is forced to achieve a readaptation to an environment using limited resources, a process not unlike the processes by which development or underdevelopment are produced to begin with . . . In other words, we must recognise that 'recovery' especially in an underdeveloped society, is a 'development process' in and of itself. It amounts to the establishment of a set of patterns which reassert the adjustment of a human population to an environment. After all, development itself amounts to a process by which a population improves its level of adaptation to an environment and through such improvements raises the level at which it satisfies human needs and wants, and at the same time lowers it levels of vulnerability to disruptions. For these reasons, the recovery process can be one which either increases or decreases the level of development of a human community.[20]

Linking the two processes is not easy. It requires the convergence and integration in an ideal-type sequence of citizen awareness leading to political will for action, leading to policies and programmes based on laws and legislation, leading in turn to implementation of risk reduction measures that will be consistent with other developmental activities. All this, furthermore, requires the presence of knowledgeable personnel, good planners, adequate resources and politically astute managers — often in short supply, particularly in developing countries. However, because something is difficult in no way implies that it is not the appropriate course to be followed.

In addition, looked at from another angle, some questions need reliable answers. What are the present and future costs (social and political as well as economic) of the contemporary tendency to compartmentalise disaster and developmental planning? Especially in developing countries, would not the possible overheads of integration make development plans more economically

costly? Are 'costs' less than would be incurred in efforts to integrate the two planning processes? Moreover, while there could be 'gains' in the long run in a stronger linking of the planning for development and for disastrous occasions, might not short-term development interests take priority? Would transnational corporations that seek lowest-cost economies in setting up operations, see 'gains' or 'costs' in linking the two processes? What actual data exists one way or the other on such questions?

V There is a need to ascertain in what ways disaster problems are similar to and different from other environmental problems.

As we have discussed elsewhere, there is a tendency to compartmentalise the attention paid to disasters. In the United States, for instance, at the community level there usually is separate planning for disasters resulting from hazardous chemicals, separate plans for flood threats, separate planning for emergencies in nuclear plants, etc. In Great Britain, which national agency takes the lead role in dealing with a nuclear threat depends on such matters as the source of the threat, whether for example it originates within the British Isles or outside, etc. The United Nations itself has a variety of different agencies focusing on different types of disasters, such as famines, oil spills, earthquakes, epidemics, etc. There are major gaps, especially in developing countries, between those concerned with disasters and those with developmental planning. Such kinds of social organisational arrangements, although often understandable in terms of bureaucratic and political realities, are poor models of how to deal effectively and efficiently with disasters. They are unnecessarily economically costly, generative of conflict among agencies, lead to administrative duplication, and are wasteful of the time, effort and attention of anyone genuinely interested in doing something about disasters.

Unfortunately, there is yet another widespread separation of disasters from something else to which they might be linked, ie other environmental problems. The personnel, organisations and resources committed to disasters are frequently in social circles and worlds different from those focused on other environmental problems. More important, they are seldom studied or discussed in any common framework.[21]

Our view is that it would not be very useful to fully equate disasters with all other environmental problems (apart from the fact that technically in sociology, disasters are not 'social problems'). As written elsewhere, many ecological problems often thought of as part of environmental problems, especially those that operate at a macrolevel, differ from disasters in some of their origins, careers and effects.[22] We have in mind such global processes as atmospheric warming with attendant ozone depletion and sea level rises, desertification and drought along with deforestation, acid depositions into the biosphere and soil degradation, and the decrease in biodiversity.

That said, this does not mean that there are not some common elements in all environmental problems, particularly if the latter are thought of in a broad sense so as to include natural and technological disasters. What these are needs to be established, for the present-day research base on this is weak. Yet even now we can see some similarities.

Interestingly, the very general pattern we have stressed, that the world is faced with more and worse disasters, has been also stated for environmental problems, with, in both cases, the problem being seen as most acute in developing societies. Thus, it has been written:

> 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.[23]

Along somewhat similar lines, Smelser in fact singles out as a source of most such environmental problems, the industrialisation in developing countries that we also see as a source of future disaster problems. Likewise, both kinds of crises — disastrous occasions and environmental problems — tend to have similar negative consequences: casualties, economic losses, psychological stresses, social disruptions, and political costs, not to mention further environmental degradation and ecological imbalance, and of course serious impediments to national socio-economic development.

What is implied by these observations is that we should attempt to ascertain in what ways disasters are similar to and different from environmental problems. To the extent that there are similarities over and above those we have just generally mentioned, it suggests that there should be a pooling of strategies, policies, programmes and measures that could be commonly treated.

In concluding, we need to note that there is a need to be realistic about what can or cannot be achieved. There are limits. A risk-free society is a chimerical dream. If the production of mushrooms were invented today, there would be those that would urge their total prohibition. The notion that hazards and subsequent disastrous occasions can be completely eliminated is not borne out by history. In fact, it is even difficult to foresee where the risks might be, even in the technological area. For instance:

> The sheer complexity of many technical systems can defeat efforts to predict their failure modes. 'The sequence of human and mechanical events leading to the two most serious power reactor failures in the U.S. [at Browns Ferry and Three Mile Island] were excluded from fault tree analysis in the most comprehensive study of reactor safety ever undertaken'.[24]

Nevertheless, that not everything can be done, does not mean that something cannot be done. We can decrease the number and magnitude of future disasters and catastrophes and lessen somewhat the qualitative worsening of their effects. We should take the necessary steps to do so. If the right policies and measures are put in place the future will not be the past revisited nor will it be only the present repeated.

Notes

1 This is an updated and expanded document prepared for the Workshop on Natural Disaster Reduction held in July 1996 in Aspen, Colorado.

2 E. L. Quarantelli is a Research Professor at the Disaster Research Center, University of Delaware, Newark, Delaware 19716, USA. Email:elqdrc@udel.edu.

3 See Quarantelli, E. L. (1993) The Environmental Disasters of the Future Will be More and Worse But the Prospect is Not Hopeless. *Disaster Prevention and Management.* Vol. 2, pp 11-25: Quarantelli. E. L. (1996) The Future is Not the Past Repeated. Projecting Disasters in the 21st Century From Present Trends. *Journal of Contingencies and Crisis Management.* Vol. 4,

pp 228-240; and Quarantelli, E. L. (1997) *Future Disaster Trends: Implications for Programs and Policies*. Preliminary Paper #256. Newark, DE: Disaster Research Center, University of Delaware. See also Rosenthal, U (1998) Future Disasters, Future Definitions. In Quarantelli, E. L. (ed.) *What Is A Disaster? Perspectives on the Question*. London: Routledge.

4 Lenski, G., Lenski, J. and Nolan, P. (1991) *Human Societies: An Introduction to Macrosociology*. New York: McGraw Hill.

5 Jones, B. (1992) Population Growth, Urbanization, Disaster Risk and Vulnerability in Metropolitan Areas: A Conceptual Framework. In Kreimer, A. and Munasinghe, M. (eds) *Environmental Management and Urban Vulnerabilities*. Washington, DC: World Bank.

6 Quarantelli (1993), op cit; Quarantelli (1996), op cit; Quarantelli (1997), op cit.

7 Quarantelli, E. L. (1992) Urban Vulnerability and Technological Hazards in Developing Societies. In Kreimer, A. and Munasinghe, M. (eds) *Environmental Management and Urban Vulnerability*. Washington, DC: World Bank.

8 Quarantelli, E. L. (1993) An Exploratory Comparison of the Characteristics and Consequences of Disasters and Riots. *Journal of Contingencies and Crisis Management*. Vol. 1, pp 67-78.

9 Quarantelli, E. L. (1988) Disaster Crisis Management: A Summary of Research Findings. *Journal of Management Studies*. Vol. 25, pp 373-385.

10 Lechat, M. (n.d.) *Global Considerations for Implementation of Telemedicine*. Unpublished Paper. Louvain, Belgium: Center for Research on Epidemiology of Disasters, Catholic University of Louvain, p 2.

11 Quarantelli, E. L. (1997) Problematical Aspects of the Information/Communication Revolution for Disaster Planning and Research: Ten Non-technical Issues and Questions. *Disaster Prevention and Management*. Vol. 6, pp 94-106.

12 Lovins, A. and Lovins, L. H. (1981) *Energy Policies for Resilience and National Security*. San Francisco, CA: Friends of the Earth Inc, p 63.

13 Lovins, A. and Price, J. (1975) *Non-Nuclear Futures: The Case for An Ethical Energy Strategy*. New York: Harper and Row, pp 17-18.

14 See Clarke, L. and Short, J. (1993) Social Organization and Risk: Some Current Controversies. *Annual Review of Sociology*. Vol. 19, pp 375-399; Rochford, E. and Blocker, T. J. (1991) Coping With 'Natural' Hazards as Stressors: The Predictors of Activism in a Flood Disaster. *Environment and Behavior*. Vol. 23, pp 171-194; Stallings, R. (1988) Conflict in Natural Disaster: A Codification of Consensus and Conflict Theories. *Social Change Quarterly*. Vol. 69, pp 569-586; Wijkman, A. and Timberlake, L. (1984) *Natural Disasters — Acts of God or Acts of Man?* London: Earthscan.

15 Quarantelli, E. L. (1991) Disaster Response: Generic or Agent-specific? In Kreimer, A. and Munasinghe, M. (eds) *Managing Natural Disasters and the Environment* Washington, DC: World Bank.

16 As an example, see Belardo, S. and Harrald, J. (1992) A Framework For the Application of Group Decision Support Systems to the Problem of Planning for Catastrophic Events. *IIEEE Transaction on Engineering Management*, Vol. 39, pp 400-411, which shows the basic similarities in planning for earthquakes and catastrophic oil spills.

17 Stallings, R. (1995) *Promoting Risk: Constructing the Earthquake Threat*. New York: Aldine de Gruyter.

18 Quarantelli (1996), op cit.

19 Anderson, M. and Woodrow, P. (1989) *Rising From The Ashes: Development Strategies in Times of Disasters*, Boulder, CO: Westview, point out that is particularly true in developing societies.

20 Bates, F. and Peacock, W. (1987) Disasters and Social Change. In Dynes, R , De Marchi, B.

and Pelanda, C. (eds) *Sociology of Disasters: Contribution of Sociology to Disaster Research.* Milan, Italy: Franco Angeli, pp 362-363.

21 Quarantelli, E. L. (1992) Can and Should Social Science Disaster Research Knowledge and Findings From Developed Societies Be Applied in Developing Societies? *Asia-Pacific Journal of Rural Development.* Vol. 2, pp 1-14.

22 See Bates, F. and Pelanda, C. (1998) An Ecological Approach to Disasters. In Dynes, R. and Tierney, K. (eds) *Disasters, Collective Behavior, and Social Organization.* Newark, DE: University of Delaware Press; Faupel, C. (1987) Human Ecology: Contributions to Research and Policy Formation. In Dynes, R., De Marchi, B. and Pelanda, C. (eds) *Sociology of Disasters: Contribution of Sociology to Disaster Research.* Milan, Italy: Franco Angeli; Quarantelli, E. L. (1993) Technological and Natural Disasters and Ecological Problems: Similarities and Differences in Planning For and Managing Them. *Memoria del Coloquio Internacional: El Reto de Desastres Technologicos y Ecologicos.* Mexico City, Mexico: Academia Mexicana de Ingenieria.

23 Smelser, N. (1991) The Social Sciences in a Changing World Society. *American Behavioral Scientist.* Vol. 34, pp 518-529.

24 From Rasumusson et al, NRC, 1975, quoted in Lovins, A. and Lovins. L. H. (1981) *Energy Policies for Resilience and National Security*. San Francisco, CA: Friends of the Earth Inc, p 63.