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CENTRALIZATION AND NATURAL DISASTER RESPONSE: A PRELIMINARY HYPOTHESIS AND INTERPRETATIONS

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INTRODUCTION

The social science literature on disasters lacks studies done within a cross-national comparative framework.[1] The influence of societal level structures on the nature of natural disaster response is the problem addressed here. More specifically, the effect of the degree of centralization on the performance of eight categories of disaster functions is studied in three nations: Italy, Japan and the United States.

[1] Almost all disaster studies done outside of the United States are listed in Quarantelli (forthcoming), but few of these are actually comparative studies (Roth, 1970; Dynes, 1972). The few exceptions compare Mexico and the United States (Clifford, 1956; Hundley, 1965), India and the United States (Grimshaw, 1964), The United States and Canada (Adams, 1967), Japan and the United States (Dynes, Haas and Quarantelli, 1964), Italy and the United States (Quarantelli, 1970), and the American military with the military in Japan, El Salvador and Chile (Anderson, 1969). Also, with few exceptions, the theoretical social science literature on disasters makes few references to either differences or similarities in disaster responses in different societies.

CRITICAL DIMENSIONS OF THE RESEARCH

The concepts of "disaster agent" and "disaster" are often used interchangeably. We use the term "disaster agent" to refer to natural phenomena such as earthquakes, hurricanes, typhoons and floods. "Disaster" refers to the social disruption that often follows the impact of a disaster agent. This study concentrates on "natural disaster," i.e., social disruptions brought about by "natural" agents as contrasted to man-made agents such as explosions. The research examines the effect of centralization on the system response to natural disasters.

The three dimensions emphasized in the study are (1) the nature of the disaster agents, (2) the structures of the societal systems within which the disaster agents strike, and (3) the nature in which disaster response functions are fulfilled.

The Disaster Agent

An effort is made to hold disaster agents and disaster experiences relatively constant, and thus allow the study to focus on the relationship between the other two dimensions. An earthquake and two water related disasters are studied in each of the three nations

TABLE I

Countries, Agents and Sites

Countries	Number of Disaster Impacts Recorded (1947–1967)	Rank on Number[a] of Disaster Impacts Recorded (1947–1967) Among a sample of 81 nations		Agents and Sites		Number of Interviews Conducted During Study	
		Rank	Decile			Disaster	Nation
Italy	21	7	1	Flood, 1966	Florence	8	
				Earthquake, 1968	Sicily	7	
				Flood, 1969	Piedmont/Vercelli	24	
							39
Japan	44	2.5	1	Earthquake, 1964	Niigata	28	
				Typhoon/Flood, 1966	Yamanashi/Ashiwada	22	
				Typhoon/Flood, 1967	Hiroshima/Kure City	23	
							73
United States	201	1	1	Earthquake, 1964	Alaska/Anchorage	251	
				Hurricane/Flood, 1965	New Orleans	134	
				Hurricane/Flood, 1969	Mississippi/Biloxi and Pass Christian	52	
							437
						Total	549

[a]Kenneth Hewitt and Lesley Sheehan, "A Pilot Study of Global Natural Disasters of the Past Twenty Years," University of Toronto, Working Paper Number 11, 1969: 14–15.

(Table I). Italy, Japan, and the United States, the nations chosen for study, all rank in the first decile of a sample of eighty-one world nations in the number of disaster impacts experienced between 1947 and 1967 (Hewitt and Sheehan, 1969:14–15) (Table I). The disasters studied occurred in geographical regions that are varying distances from the center of national government in each nation (Table I). The disaster sites vary from a large metropolitan area (500,000+) to a middle sized city (50,000), to a smaller community (under 10,000) in each society (Table I). Thus, the disaster agents, the number of disasters experienced, and the geographical location and size of the sites studied are similar in each nation (Table I). This allows the researchers to treat the disaster agents as test factors stimulating change, and to concentrate on the relationship between the other two dimensions (Table II).

The Structure of Societal Systems

The explanatory, or independent, variables emphasized in the study are the societal system structures and institutions of Italy, Japan and the United States. These three nations are all what Banks and Textor (1963:65–66) would refer to as large in population, developed in economic status, politically westernized and modern, and having developed mass media. The similarity of these countries on the clusters

of demographic, economic, political and communication variables cited, allows the researchers to concentrate on the key variable of degree of centralization (Figure 1).

Degree of centralization is the independent variable on which this study focuses. The guiding hypothesis of this study is that a centralized society will react to disaster in ways that are different from a decentralized system. Centralization may be viewed in two ways: (1) as the structure of power in a system, and (2) as the pattern of decision making. A structurally centralized system is one in which the central, or highest level, retains power to itself. A centralized pattern of decision making is one in which fewer participants make decisions and the decisions are made at a higher level. Italy and Japan are described in the literature as highly centralized governments structurally and in patterns of decision making (Banks and Textor, 1963; Kogan, 1962 and Ward, 1967). The United States is a decentralized system.

The Disaster Response Functions

A list of eight activities and functions that are carried out in disaster situations has been developed from previous research (Figure 1). The list includes the following: (1) warning, (2) emergency preparedness (precautions taken after warning), (3) evacuation, (4) inventory (assessing and mapping the situation), (5) victim care (search, rescue, medical care and care of the dead), (6) security, (7) welfare (as distinguished from long-term rehabilitation), and (8) emergency restoration of services.

RESEARCH METHODS

Societal structures are the independent variables. The nations studied are similar on a number of independent variables, but they are contrasted on the key independent variable, i.e., political centralization (Figure 1). The disaster agents provide stimuli to which societies respond, i.e., they are treated as test factors.

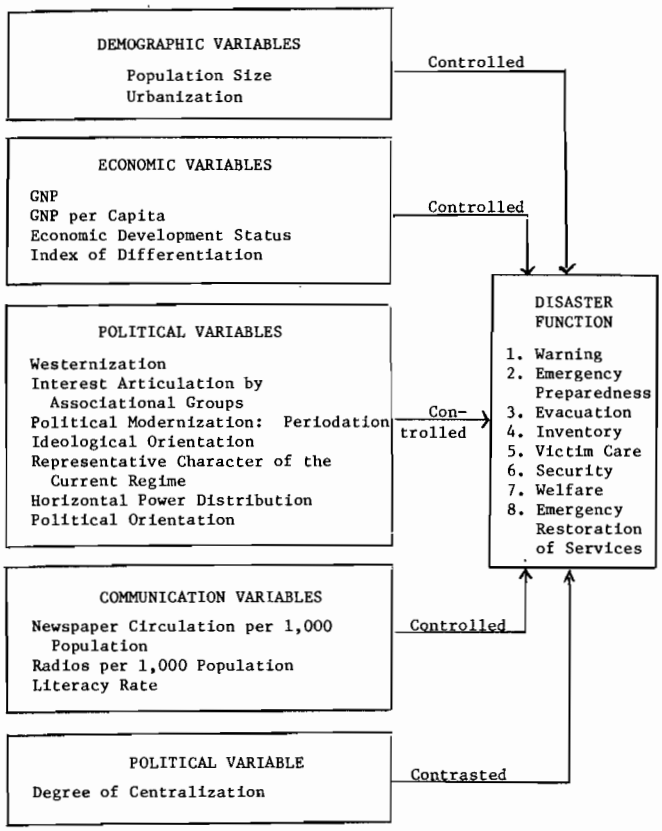

Fig. 1. The independent and dependent variables

The eight disaster response functions are the dependent variables. The research design is diagrammatically depicted in Table II.

The data used in the study were gathered from the following sources: interviews, observations on the scene, supporting printed material and general library literature.[2] Interviews were conducted with officials connected with the disasters. The interviewees were approached as informants and respondents. In six of the nine disasters studied, field work was conducted shortly after the disaster agent struck. The number of interviews conducted in each disaster and country is listed in Table I.

[2] The vast bulk of the material used in this article was obtained by field teams of the Disaster Research Center at The Ohio State University. We thank the Center for permission to use the material in their files. All interpretations of the data represent our own views and do not necessarily reflect the views of the Disaster Research Center regarding the same material.

TABLE II

Design

Independent Variables (Societal Structure)	Test Factor (Disaster Agents)	Dependent Variables (Disaster Response Functions)
$S_{a,\ 1-3}$	X_{1-3}	O_{1-3}
$S_{b,\ 1-3}$	X_{1-3}	O_{1-3}
$S_{c,\ 1-3}$	X_{1-3}	O_{1-3}

S=Society
a Italy
b Japan
c United States

X=Disaster Agent
1 First Disaster
2 Second Disaster
3 Third Disaster

O=Response

THE FINDINGS

It is hypothesized that a centralized society reacts to disaster in ways that are different from a decentralized society. Just as in "normal-time" situations, fewer positions are responsible for decision making during disasters and these positions are at a higher level in the centralized governments of Italy and Japan than in the United States. Corollary hypotheses are that these patterns lead to delays as decisions are passed up the hierarchy and back down, and actors at the disaster sites have less flexibility in decision making. The expected relationships between the degree of centralization and the nature of disaster response are supported by the findings, but a number of qualifications need to be added. These qualifications and the patterns of response associated with them are examined in the remainder of this section under the categories of (1) time factors, (2) structural factors and (3) normative factors.

Time Factors

The degree of centralization of decision making and response varies dramatically through different time periods of disaster in all three societies. Disaster response may be divided into three time periods: (1) pre-impact, (2) emergency and (3) post-emergency. The *pre-impact* stage is that period before the disaster agent strikes the community or region. During this period, depending on the type of agent and certain other factors, warning and emergency preparedness functions may be put into operation. The *emergency* stage is the time of greatest disruption of the social system when certain essential functions are not being fulfilled. It occurs immediately following impact and may continue for varying periods of time. The *post-emergency* period is that in which most essential services have been restored.

Certain disaster response functions tend to occur during particular time periods, while others may be performed during more than one time segment of disaster response. For example, warning about the primary disaster agent occurs during the pre-impact period, but security functions may be performed during all three stages of disaster response.

The patterns of response that emerged in all three of the societies studied were strongly influenced by the dimension of time. The responses during the pre-impact and post-emergency periods more closely resembled the nondisaster structures and patterns of decision making. The patterns during the emergency stage, particularly in the time period immediately following impact, were quite different than what occurred in nondisaster situations.

In the three instances of earthquakes there

were no warnings. In Japan and the United States the warnings concerning typhoons and hurricanes were accomplished through coordination of central, regional and local systems. The structures and patterns of the warning systems in Japan and the United States show some similarity because of the nature of the disaster agents and the technological levels of the two nations. The warning responses were different because of the difference in the degree of centralization between the two nations.

Typhoons and hurricanes allow for extended warning time as they build up slowly, they cover large geographical areas, and the detection of their presence, nature and direction requires a high level of technological resources. The slow build-up of the agents allows for coordination between a number of levels of the system. Because the storms cover large geographical areas as they move from sea to land and over the land, a number of local and regional systems are affected and become involved in the warning process. The level of technology used in the detection and warning is dependent on resources that a local level system would find difficult to support. Therefore, there is a combination of various level systems in the warning response.

The structure of the society leads to the greater centralization of the Japanese warning system. The Japanese system uses four system levels in the warning process (i.e., national, regional, prefectural and local), but they are coordinated according to a rather complex authority system of national level disaster countermeasures. Maximum flexibility is built into the system, but rules are elaborated that set limits on lower level decision makers. National level meteorological information input is a part of the system in the United States, but the decision to warn is more clearly reserved for the local areas. In summary, Japan and the United States use a combination of system levels in warning, but the regional and local levels appear to be of greater importance in the United States.

In the two flood disasters in Italy there was a lack of general and systematic warning. The officials of Florence knew of the impending danger, but decided against sending out a general warning. They were afraid that large numbers of people would attempt to evacuate the city and cause traffic congestion. They reasoned that large numbers of people and machinery on the narrow streets of Florence could well lead to many deaths. In the Piedmont, the rains were so widespread that it was difficult to predict which of the many small rivers might flood. The warning process in Italy, however, was also affected by a hesitancy on the part of officials to issue warnings without approval from more central authorities.

The other function that is concentrated in the pre-impact stage of disaster response is emergency preparation. A similar pattern was followed in the performance of this function as in warning. In Japan specific disaster plans were followed with local officials and firemen waiting and ready and prefectural government resources standing in reserve. There is more centralization of activities in Japan than might appear from first observation. The centralization is by means of rules, or plans, that have been elaborated during pre-disaster periods. The emergency preparations planning in Italy also follows a centralized plan. The emergency preparations actually carried out in the floods in Florence and the Piedmont were limited because of the lack of general warning. The municipal and county levels of government were the key units initiating emergency preparations in the United States disasters.

During the pre-impact stages of disaster response, the three nations generally followed the predicted response, i.e., centralized response in Italy and Japan and decentralized response in the United States. In the Italian disasters there was a more cautious approach to initiating action, with each level seemingly waiting for the next level to give the order. The Japanese response was one of coordinated effort by the three levels of government according to pre-

disaster laws and plans. In the United States there was coordinated effort between the various levels of the system, but the local level system was more heavily involved in decision making.

During the emergency period of disaster response all three nations responded in ways that were similar to each other, but different from normal-time decision making patterns. The urgency of the situation, the unexpected nature of some of the stress situations and the breakdown of communication between certain levels of government, all contributed to a rather emergent and decentralized pattern of response to stress. Functions such as search and rescue were carried out by the closest unit.

The response during the post-emergency period more closely resembled the nondisaster patterns of decision making. In Italy both the prefect and the Director General of Civil Defense, officials of the central government, asserted control. In Japan too, there was centralized response in accordance with pre-disaster laws and regulations. The United States was the most decentralized of the three nations.

The patterns of disaster response fluctuate through the three stages of disaster response. They are most like the nondisaster patterns in the pre-impact and post-disaster periods, with Italy and Japan being generally centralized and the United States decentralized. They are least similar to pre-disaster patterns during the emergency period following impact, with all three nations having emergent, ad hoc, and decentralized response (Figure 2).

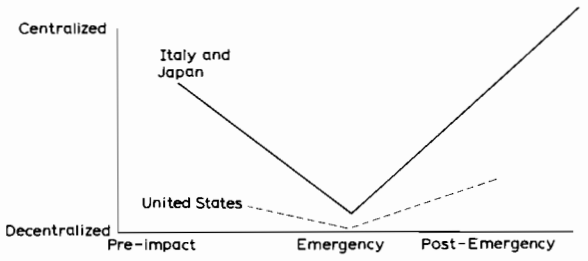

Fig. 2. Patterns of response by stage of disaster

Structural Factors

A second cluster of factors that influence the affect of the degree of centralization on disaster response is structural. Two particularly important structural dimensions that influence the nature of response are: (1) levels of technology and (2) degree of structural differentiation. Two additional qualifications are: (1) the intraorganizational structure of key units in disaster response, and (2) the level of resources of the local and regional systems within the three nations.

It was common in all three nations, irrespective of their degree of centralization, that tasks requiring a high degree of specialized expertise or equipment were completed by calling in specialized outside resources. In the Piedmont floods, helicopters were flown in from nearby North Atlantic Treaty Organization bases to rescue stranded people. In Japan, road building equipment was sent from the prefecture and beyond to open up roads for relief. In Alaska, special gas line equipment and the men to operate it were flown from thousands of miles away.

In each of these instances, and others requiring specialized skills and equipment, needs were filled by bringing in personnel with those specialties from outside the area. In Italy and Japan there was more of a tendency for these outside personnel to be controlled centrally, and in the United States they worked under the coordination of local authorities. In all cases, however, there was a certain amount of autonomy and control exercised by the specialists because of their expertise.

All three nations are highly differentiated structurally. There is a complex division of labor that handles both the nondisaster and disaster system functions. The Italian system has a division of labor between organizations that follows vertical lines from the national to the municipal levels. The tendency is for decisions to be passed up and down vertical lines of command. The Japanese system is similar to the Italian in that a number of decisions are

passed up and down vertically differentiated lines of command. In Japan, however, there are laws and regulations that provide for coordination on each level by an anti-disaster council. The large number of specialized organizations working in the United States is organized and coordinated by local level decision makers.

The intraorganizational structures of key units affect the nature of response also. For example, the fire fighting organizations in each society perform essential functions and are central to the total response. Japan and the United States organize fire fighting units on the local level. These key units work in their own geographical areas. When they are to be coordinated, they are more likely to be coordinated by the officials responsible for that area. In Italy the Division of Civil Protection organizes fire brigades on a national level. They are controlled in a more centralized manner than fire units in either Japan or the United States.

One further qualification to the nature of response is linked to the resources of the region and municipality experiencing the disaster. The differences in response between the Piedmont and Sicilian disasters were influenced by the differing resources of the local areas. The Piedmont is an affluent area of Italy with a number of highly trained administrators. Sicily is a relatively poor area with fewer physical resources and fewer trained administrators. A high number of decisions were made locally in the Piedmont in contrast to Sicily.

In summary, then, structural factors do not change the direction of the central hypothesis concerning the influence of centralization on disaster response, but they influence the degree of difference accounted for by centralization.

Normative Factors

Normative factors also have bearing on the nature of the disaster response. Three normative issues that appear to be important are: (1) the social rhythm of communities, (2) cultural heterogeneity between regions within nations, and (3) the sensitivity of the disaster response functions being performed.

Communities and regions have a rhythm of social time. To disrupt that pattern may be costly financially and in terms of time and convenience, and negative sanctions may be brought against officials and organizations that disrupt such patterns. For example, to evacuate a population from a Gulf Coast community in the United States or from the city of Florence, Italy, means a loss of revenue to businessmen and inconvenience for all concerned. There are negative sanctions that have been applied to individuals and organizations in the United States for calling for evacuation when the threatened disaster agent did not strike the communities. The decisions to send out warnings and to take emergency precautions are not taken lightly. Officials are generally careful to make such decisions according to established structures and procedures. This is true in both centralized and decentralized systems. It is more often the case in the pre-impact stage of response than in the emergency stage. During the emergency stage of response the normal-time rhythm of the community or region has already been disrupted and the urgency of the tasks to be performed means negative sanctions are less likely to be applied.

Within the nation of Italy there are cultural differences between the northern and southern regions of the country. The Piedmont area is one in which a strong element of the culture and history has been a stress on regional independence. This seemed to be reflected in a greater amount of local coordination and control than in the earthquake in Sicily. This research did not find such within-nation differences in Japan. In the United States such within-nation heterogeneity tends to reinforce the already existent patterns of decentralized decision making and response.

Such functions as warning and emergency preparedness are performed during the pre-

impact stage and are more sensitive than certain other functions such as search and rescue which are performed during the emergency stage of disaster response. Preservation of life is the cultural value and rescue functions are directly and immediately related to this core value, and this appears to override normal-time normative structures that reinforce centralized decision making. Emergent norms often arise during the emergency period. The outside threat brings about a consensus in the community that allows for the breaking of previous patterns. These new norms remain during the immediate crisis, and they are gradually replaced by a movement back to nondisaster patterns as the urgency of the emergency state passes. The patterns of disaster response are centralized in Italy and Japan in comparison to the United States, but they are influenced by the normative factors cited above.

SUMMARY

The original hypotheses are supported by the empirical evidence. A centralized society reacts to disasters in ways that are different from a decentralized society, i.e., fewer positions are responsible for decision making and these positions are at a higher level in a centralized society. The corollary hypotheses state that centralized patterns of decision making lead to delays in response and less flexibility in decision making. This is supported in the case of Italy, but not in Japan. While the Japanese have a centralized system, it is elaborated in such a fashion that the three system levels respond according to pre-arranged plans that result in rapid response and enough flexibility to meet the exigencies that arise.

While the central hypotheses are supported, they are qualified by a number of conditions that are classified as time factors, structural factors and normative factors. In light of the empirical evidence a number of summary hypotheses related to these qualifiers have been generated.

1a. Response during the pre-impact and post-emergency stages is similar to nondisaster patterns of decision making.

1b. Response during the emergency stage is emergent, ad hoc and decentralized.

2a. Tasks requiring a high level of technological resources are accomplished through the use of specialized outside or higher level system resources.

2b. The extent of outside or higher level system involvement in disaster response varies inversely with the resources of the impacted region.

3. The actual impacting of the disaster agent brings about a community consensus that allows for the breaking of normal-time decision making patterns and the emergence of new patterns.

In summary, the empirical evidence supports the central hypothesis of the study, i.e., a society that is centralized in its normal-time decision making patterns will respond to the stress induced by natural disasters in ways that are different from a decentralized society. A number of qualifications that affect the nature of response have been discussed. These qualifications are consistent with the generalizations suggested by some writers in the area of collective behavior (Weller and Quarantelli, 1973; Stallings, 1973). Natural disasters bring about a crisis in the system, i.e., situations in which normal-time structures and patterns do not meet the demands of the system. This sets the context for the emergence of new structures and patterns. The emergent structures and patterns meet with little opposition in natural disasters, because natural disasters are characterized by consensus and lack of conflict. As the most urgent and disruptive stage of the crisis passes, the normal-time patterns begin to be asserted once again. The empirical research from which these generalizations develop tends to concentrate on studies of communities in the United States. The present data expand the limits of previous generalizations to societal level systems cross-nationally.

The qualifications to the central hypothesis of this study, while they do not change the direction of the overall response, are important influences on the nature of decision making that are deserving of further research. Some areas that are deserving of further study are the following: 1) the expanding of the generalizations from this study to other nations, particularly nations that differ from Italy, Japan and the United States along such dimensions as the demographic and economic; 2) the further comparison of response in stress situations that vary as to the degree of consensus; and 3) the comparison of these qualifications from natural disasters with normal-time situations, e.g., politically sensitive issues compared to nonsensitive issues.

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NATO'S APPROACH TO NATURAL DISASTER RELIEF

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INTRODUCTION

All the problems associated with natural disasters have been of great concern to man throughout recorded history. Traditionally they have been dealt with by individuals working independently or in localized voluntary groups. In more recent times national states have undertaken to support research on causes of the natural phenomena that can produce disasters for mankind; to experiment with better forms of building construction to resist the onslaught of adverse natural conditions; to assume more and more responsibility for providing emergency relief and assistance in reconstruction for the victims of natural disasters; to legislate better building codes, stricter zoning or land use plans, insurance programs, etc., which would provide a stronger shield of support against the vagaries of Mother Nature. National private voluntary organizations have also worked abundantly and effectively, especially in emergency relief and in certain areas of basic research.

In the very recent past, concern for the causes and consequences of natural disasters and possible safeguards against them has moved up to the level of international public bodies and international voluntary agencies. Groupings of private organizations with rather loosely centralized international structures, such as the League of the Red Cross Societies, functioned effectively to provide emergency disaster relief before the international public bodies began to address themselves to these problems. Since the early 1950's, several members of the United Nations family of organizations and some regional organizations, such as the Organization of American States (OAS) and the North Atlantic Treaty Organization (NATO), have given more and more attention and growing financial support to solve problems of natural disasters. Research, experimentation with warning systems, conference deliberations for exchange of information, and direct aid to victims of natural disasters through emergency relief, sometimes followed by long-term reconstruction, have been receiving substantial and growing amounts of support in these international bodies.

NATO'S RESPONSE TO THE PROBLEMS OF NATURAL DISASTERS

President Richard Nixon, in an address at the NATO Ministerial Meeting in Washington, D.C., on April 10, 1969, recommended that NATO countries develop a "third dimension" of program activity to deal with "our concern for the quality of life in this final third of the twentieth century". The North Atlantic Coun-

cil pursued this idea through discussions during the year and on November 6, 1969 created the Committee on Challenges of Modern Society (CCMS) and charged it with the question of how to improve, in every practical way, the exchange of views and experience among allied countries in the task of creating a better environment for their society and to consider specific problems of the human environment with the deliberate objective of stimulating action by member governments.

On December 8, 1969 the NATO Committee on the Challenges of Modern Society (CCMS) held its first plenary meeting in Brussels. Since the thrust of the Council's charge to the CCMS stressed the need to create a better human environment it is not surprising that of the original eight specific subjects approved for CCMS study and actions, seven dealt with questions of water pollution, air pollution, highway safety, prevention of oil spills and other "environment" topics.

All of these seven subject areas were on problems directly related to the industrialization and modernization of society. They were concerned with the price paid for "progress" or were problems concomitant with "progress" although in ways not anticipated by the promoters of progress. The remaining topic of study approved at this first meeting of the CCMS was focused on the problems imposed on modern society by natural disasters rather than by the works of man.

Natural disasters certainly are not a modern phenomenon only and they are not peculiar only to industrialized or modernized societies. The impact of natural disasters has been increasingly heavy, however, on modern, industrial societies and the menace to those societies from natural violence is growing and compounding rapidly. This problem area, therefore, fitted clearly the mandate given to the CCMS and also was well within the broad language of Article 2 of the North Atlantic Treaty (April 4, 1949) charging the parties to the treaty with "promoting conditions of stability and well-being".

The Disaster Assistance Program which was endorsed by the CCMS on December 9, 1969 and approved by the North Atlantic Council on January 28, 1970, was adopted as a result of an initiative of the United States. General George A. Lincoln, Director of Emergency Preparedness in the Executive Office of the President, had stated the need for a NATO project of this kind at the first CCMS plenary meeting. He noted that although several other international bodies, public and private, have for many years provided help to victims of natural disasters, their financial resources and other capabilities had been quite limited. He expressed the opinion that "the massive resources available to NATO members acting in concert... can set NATO countries apart as a unique association for disaster assistance". The high degree of political, cultural and economic unity – and the organizational capability to research, to plan, and to respond operationally – contribute further to NATO's unique capabilities (CCMS, 1972a).

With these and other considerations and premises in mind the CCMS after endorsing the proposed subject asked the United States to serve as the "pilot nation" and Italy as the "co-pilot nation". Turkey was added later as a second co-pilot nation. Some analysis of the premises for this project is in order.

There is first of all the basic premise that natural disasters pose a potential and growing threat to all the NATO member states. No one could quarrel with that obvious situation. The evidence is well documented and increasingly abundant. The issue of natural disasters, their causes and consequences, obviously is an important issue but the critical question is how important is it *relatively*, alongside other current issues that confront the members of NATO? What is its salience for each of them in contemporary times?

The second basic premise is that NATO, through its fledgling Committee on the Challenges of Modern Society, could come to grips with the problems and needs arising from the recurrence of natural disasters in the NATO

member states and perhaps in other areas. This premise seems to be well founded by the Council's charge to the CCMS and by Article 2 of the North Atlantic Treaty but there are some pendant questions on this premise also. For example, how could the NATO states best meet the need for increased knowledge about natural disasters and for disaster relief assistance? If there are "massive resources available to NATO members" in contrast to the relatively limited resources of other international bodies concerned with exactly the same matters of causes and consequences of natural disasters, would not this need be as well met if NATO members put more resources into some of those older and more experienced disaster research and relief bodies?

All funds for all international bodies, NATO and non-NATO, after all, must come from the pockets of the citizens of the member states of these bodies or from these same citizens in the form of gifts to voluntary agencies concerned with disaster relief. The fact was, and still is, that the states with the greatest resources, public and private, that are members of NATO are also members of all the other international bodies in the UN "family" and outside of it which have dealt with some or all aspects of the significance of natural disasters for contemporary societies. There must be some special reasons then for the NATO members providing support for NATO's program of disaster assistance what could otherwise be as well or better used by non-NATO agencies. This brings us to two more premises advanced by General Lincoln and, by implication at least, endorsed by the CCMS and the North Atlantic Council.

These premises were that in NATO there is a "high degree of political, cultural and economic unity and... organizational capability to research, to plan and to respond operationally..." These attributes in fact were described as part of "NATO's unique capabilities". Were these premises valid as of December 1969? Have they been valid premises, in the context of natural disaster affairs, in the years since the disaster assistance program was approved by the NATO Council? Are they valid premises for the near future?

These questions may have been in the minds of the members of the CCMS and of the North Atlantic Council. If they were they did not, obviously, keep the representatives from approving the Disaster Assistance Program. I have seen no documentation that suggests that such questions were discussed formally but very likely they were touched upon by some representatives in informal discussion.

ORGANIZATION AND PLAN OF OPERATION FOR THE NATO DISASTER ASSISTANCE PROGRAM

As noted above the United States and Italy were designated the pilot and co-pilot nations for this project. They were appropriate leaders, of course, because both nations are probably the most disaster-prone members of NATO and are among the most disaster-prone of all countries. In variety, number and severity of natural disasters they are, to say the least, highly experienced and their national governments in recent years have been deeply concerned with the problems of the causes and consequences of natural disasters. Turkey, which became a second co-pilot nation later, also qualified on grounds of experience with natural disasters and very recently on governmental concern for a joint leadership role. As project pilot and co-pilots these nations assumed the responsibility to lay out plans for the program, fund most of its costs, see that action resulted from specific projects within a span of a few years and also be the reporter of such actions and of any follow-up activities in the NATO states resulting directly from the Disaster Assistance Program.

The U.S. delegation to the January 28, 1970 meeting of the CCMS set forth its concept of a NATO disaster assistance program. The suggested format for the proposed NATO disaster

assistance program was confined to four broad categories of activity (NATO, 1970a). These categories covered procedures for exchange of information about natural disasters; provision of technical advisers to work with national authorities in the event of natural and "man-made" disasters; a proposed NATO "pool" of relief supplies; and possible coordination of relief efforts by NATO members. It was agreed at this meeting of the CCMS to hold a program planning conference in Rome in early March of 1970, for the disaster assistance project.

On March 10–11, 1970, eight NATO nations interested in this CCMS program met in Rome, hosted by the Italian government, to discuss a possible set of objectives. Substantially the same objectives as those suggested by the United States were approved at Rome and a program of activities was agreed upon (CCMS, 1972a). The emphasis was put on NATO's ready capability to assist in the coordination of disaster assistance activities among member nations and to stimulate greater interest throughout the NATO community and the wider international community in cooperative efforts designed to improve disaster assistance plans or preparedness programs.

No reference was made in the objectives agreed upon in Rome to the earlier U.S. proposal that NATO might act as a channel for the provision of technically competent advisers to work with national authorities in situations of "unusual" or "man-made disasters". This was undoubtedly a wise deletion since the range of problems in natural disasters was surely broad enough for this CCMS program without taking on the whole bundle of disasters, "man-made" as well as natural. The Rome agreement also limited possible NATO coordination of disaster relief efforts to "requests for assistance from NATO member countries stricken by a major natural disaster".

No reference was made specifically in the Rome agreement to possible exchanges of information on "disaster research and scientific advances related to disasters". This important objective may have been subsumed under the broader Rome language of "continuing exchange of pertinent information on disaster preparedness," or in the charge "to recommend concrete, feasible actions, which individual nations could take either in anticipation of a major disaster or to mitigate its effects" (CCMS, 1970a).

A more emphatic endorsement of the need for more research and better distribution of research findings on the causes and possible consequences of natural disasters, might well have been made one of the project's major objectives. NATO's involvement directly and indirectly with the western world's science community could have been a major asset to the program and one to be capitalized upon later for its overall purposes. This was an area of possible "unique capabilities" for NATO.

One other possible deficiency in the determination of the program's objectives was the very basic question as to whether or not NATO nations, or other nations, really want their responses to disasters in other countries "coordinated" by any international body, public or private. A reading of the world press, and of official government statements, at the time aid is being sent to disaster-stricken countries often suggests quite clearly that governments perceive various possible political advantages in bi-lateral responses, or a decision not to respond, to requests for help by other nations.

There is much similarity in these situations to the ways in which governments have provided, or withheld, aid for economic development with a pronounced preference for full independence of choice of action, or inaction, and resort usually to bilateral arrangements for their participation. "Coordination" is a beguiling abstraction which, however, is often an unrealistic concept in the arena of world politics. The apparent logic of "coordination" is not always persuasive to the operators of power politics and disaster relief response, alas, is no exception in this regard.

The pilot (U.S.) and co-pilot soon happily

agreed upon an emphasis that offered "practical recommendations of general applicability" and decided to focus on two major areas of concern in the field of natural disasters, namely, flood mitigation and the reduction of hazards by earthquakes. It was agreed by the other national representatives at the CCMS Rome meeting that there would be an international symposium on flood mitigation to be hosted by Italy (at Venice) in October of 1970 and a meeting of experts on earthquake hazard reduction to be hosted by the United States (at San Francisco) in May 1971.

It was agreed also at the Rome meeting to undertake as a third program objective the updating of a 1958 North Atlantic Council policy document on "NATO Cooperation for Disaster Relief in Peacetime" (NATO, 1958). This document covers most of the concepts of information exchange and coordination of disaster relief efforts envisioned in the basic objectives of the CCMS Disaster Assistance Program so to a considerable degree its revision was not a new initiative nor one as sharply focused as the proposed two conferences on major types of natural disasters.

On June 2–3, 1970 representatives from seven NATO countries met at the NATO headquarters in Brussels to draw up an agenda for the meeting on flood mitigation. In the following two days a group drawn from five NATO countries met also in Brussels and drew up plans for the meeting of experts on earthquake hazard reduction. This speedy follow-up of the decisions of the Rome meeting augured well for both of these conferences despite the quite limited number of member nations participating in planning or offering suggestions for these meetings. Since major floods have been experienced in all NATO nations and disastrous earthquakes in about half of the member states, a larger number of participant planners might have been anticipated.

This perhaps was an early sign of the drawbacks of the "à la carte" approach to the projects of the CCMS as well as an indication, perhaps, of something less than the amount of NATO unity which General Lincoln had claimed at the January 1970 meeting of the CCMS. Other current CCMS projects may have diverted the attention of some of the member states, but whatever the cause, the pattern of only partial participation by the NATO membership emerged at an early point in the history of this CCMS program on disaster assistance.

The Meeting of Experts on Flood Mitigation

From the 19th to the 23rd of October, 1970, some 90 experts from 12 NATO member states and from several other international bodies met to consider five major topics related to flood problems. The topics were: a) reduction of flood hazards; b) prediction and warning of floods; c) emergency operations resulting from floods; d) rehabilitation programs for areas suffering major floods; and e) the possible role of governments, universities, industry and voluntary organizations in researching and coping with flood causes and consequences.

Fifty-five presentations were made or summarized and later published (CCMS, 1971a), along with other short summaries of information on various topics related to floods, sea surges and tsunamis plus references to various governments' published documents on these subjects. The papers varied greatly in subject matter, length and quality, some being careful, scientific studies while others were resumes of government laws and organizations for dealing with flood problems.

Half of the presentations were made by representatives or agencies of the pilot nation, the United States (12) and the co-pilot and host, Italy (15). Canada made 11 and Belgium eight, hence these four countries made about four-fifths of all the presentations and the remainder were made by Germany (4), United Kingdom (4), and the Netherlands (1).

Again, this is a revealing commentary on the breadth of the commitment of NATO member states to this pioneering project on a topic of

obvious importance to all. It was a less substantial response than the subject deserved and the commitment undertaken.

The *conference recommendations* stressed: a) the need for more research on the lower atmosphere in order to increase the precision of forecasting problems related to rapidly rising waters; b) a better system within NATO for exchanges of technical information and scientific personnel concerned with problems of flood mitigations; and c) more adequate procedures to coordinate international assistance, within NATO and outside, whenever major natural disasters occur. In brief, the conference conclusions were the familiar trilogy of needs: more research knowledge, more exchange of information and personnel, and more coordinated responses to the consequences of disasters, including better preparedness plans.

The CCMS approved the recommendations of the Venice meeting and the NATO Council subsequently (May 1971) noted the report of the meeting and accepted the conference recommendations (NATO, 1971a). Member states were asked to report later to the pilot country what actions were being taken to implement in their countries the recommendations of the Venice conference. Italy undertook to plan a meeting to consider methods used in low altitude meteorological forecasting but no date was set.

Meeting on Earthquake Hazard Reduction

Well before the conference on flood mitigation had taken place planning had been initiated for a spring, 1971, conference in San Francisco on earthquake hazard reduction. On June 4–5, 1970 representatives of five NATO nations met in Brussels to draw up an agenda for this meeting. Turkey joined the U.S. and Italy as co-sponsors of this meeting and as a co-pilot nation for the Disaster Assistance Program. Invitations to send observers to this meeting were extended to 20 non-NATO countries and to 15 international organizations.

The conference in San Francisco was held May 20–25, 1971 with some 170 listed participants comprised of engineers, seismologists, other scientists, urban planners, disaster relief experts and assorted public officials and representatives of various international organizations: There were more non-NATO nations (nine) represented at the meeting than there were NATO states of which there were only eight: Canada, Denmark, The Federal Republic of Germany, Greece, Italy, Portugal, Turkey, and the United States. For at least two of these eight (Greece and Denmark) representation appeared to be quite perfunctory by designating their consuls resident in San Francisco as their official delegates to the meeting. NATO states with very small delegations were Portugal and the Federal Republic of Germany. Iceland, which has suffered from earthquakes, was not represented, nor was France which had experienced several earthquakes of mild severity in 1968, and the violent quake in Arethe in August 1967. The non-participation of Belgium, Norway, and the United Kingdom was also notable since all three countries had experienced mild earthquakes in the previous five years with serious earthquakes recorded in their histories.

Perhaps this substantial non-participation in the San Francisco conference reflects a general characteristic of attitudes toward natural disasters and the concern they cause citizens and public officials alike. Traumatic natural phenomena are a sometime thing; they may have happened in the past, they *could* happen again, but everybody hopes he won't be the victim of such an event in the future, and that negative hope blunts the need to think and plan affirmatively for such an eventuality. Seemingly more urgent and apparently more obvious needs push back the priority standing of natural disaster concerns – even to the extent of non-participation in a unique conference such as this CCMS meeting in San Francisco.

Sixty-eight conference papers and references to relevant government publications were published by the CCMS (CCMS, 1971b). As

with the Venice conference, the papers were of very uneven quality but a number of good studies were presented. Some documents were only abstracts of previously published studies.

The recommendations growing out of this conference included: a) better land-use planning, b) more adequate structural design to reduce building vulnerability to earthquakes, c) stricter building codes to achieve more security from earthquakes, and d) improved warning systems. The need for more efficient emergency operations and better long-term recovery programs also were covered in the conference recommendations.

Inherent in many of the findings and recommendations was the obvious need for an increase in the number and the capability of persons engaged in research on the nature of earthquakes and how to reduce the hazards from such events. In this regard an international technical training center was proposed to train persons from earthquake-prone nations and to facilitate the exchange of information relevant to earthquake-caused disasters.

The report of the conference also recommended stronger support for the work of United Nations agencies, especially for the work of UNESCO in its seismological research; more advance warning and reporting programs; and for an expanded UN role in general in the area of disaster assistance. It might be noted here that the United Kingdom and Turkey had been prominent advocates in the UN (in ECOSOC especially) for a more prominent and more central UN role in international disaster relief work.

The CCMS accepted the conference report and it was formally approved in the North Atlantic Council on January 12, 1972. The United States, as pilot country for the Disaster Assistance Program, was charged with reporting periodically on follow-up action. Turkey offered "in principle" to provide the technical training center in Ankara in cooperation with other NATO countries and other interested international bodies (NATO, 1971b). As of late 1974 the center was still only in the discussion-planning stage.

Updated NATO Policy and Procedures for Disaster Assistance

As noted earlier it was agreed by the CCMS, at the planning meeting in Rome of March 10–11, 1970, to undertake a review and possible revision of the 1958 North Atlantic Council policy document (C-M(58)102) which had provided detailed procedures for NATO cooperation for emergency disaster assistance in peacetime. This document embodied policy and operational procedures developed by the NATO Civil Defence Committee dating back to 1953.

Following exchanges of correspondence and staff discussions between the NATO Directorate for Civil Emergency Planning and the U.S. pilot country, a draft "Standing Instructions for an International Staff Disaster Assistance Coordinating Officer" was ready for CCMS review by autumn 1970 (NATO, 1970b). Italy also participated as a co-pilot in the project as it proceeded through further review in late 1971. On February 25, 1971 the NATO Civil Emergency Planning Committee received a report by the pilot and co-pilot representatives and sent it on to the CCMS. After more reviews by other Council committees, the much reviewed and revised document was approved by the CCMS on November 10, 1971, and accepted by the Council on January 12, 1972 (NATO, 1971c).

The policy statement recognized the long-standing practice of bi-lateral governmental procedures for requesting and providing disaster relief. It proposed an improvement upon this traditional practice, especially for governmental activity, by using the NATO communications system for exchanges of information on the facts and consequent needs of specific disaster situations with a view to providing more of what the disaster victims need and avoiding duplication of effort and/or

delays that often result from ad hoc responses by governments and voluntary bodies.

The need for more effective national preparedness plans was recognized and the policy statement authorized NATO experts from its Civil Defence Committee to help provide guidance to interested nations in the improvement of their disaster preparedness plans. No commitment was made by this document for NATO to provide disaster relief supplies in specific disaster situations but support personnel might be authorized, however, if requested by a stricken member country.

When the Council approved in January 1972 this revised NATO policy statement on disaster relief assistance, the three projects agreed upon at Rome had been carried out although much remained to be done to follow up on the two conferences and to implement the new disaster assistance policy statement. Since less than two years had elapsed after the Rome planning meeting, this CCMS program was quite an exception to the usual dilatory pace of multilateral undertakings. The Disaster Assistance Program was declared officially completed May 15, 1972. It was the first undertaking by the CCMS to be so identified. As of late 1974 only the U.S., Italy, Turkey, Canada, Belgium, France, the Federal Republic of Germany, and Norway made significant reports (filed in the order listed) on actions taken to follow up on the recommendations of the Venice and San Francisco CCMS conferences and *Document* CM(58)102, 1971 edition. The first three listed were, of course, the pilot and co-pilot countries for this program. On October 4, 1974 the pilot country advised other CCMS members that it was terminating further formal follow-up reporting on this project (CCMS, 1974) after having filed two successive annual reports (CCMS, 1972b and CCMS, 1973).

The rather meager reporting of follow-up actions taken by the NATO states on the disaster prevention and/or response recommendations arising from this CCMS program underscores the factor of salience of this issue on a comparative scale with other pressing contemporary issues. Besides the issues addressed in the other CCMS pilot studies there have been, of course, many other high priority problems for all of the NATO countries. In all of them increased economic development for purposes of improved economic and social well-being and greater national strength tops the list of all current issues. This objective has been greatly compromised by the impact of energy shortages. Related to this profoundly important and pressing concern are sub-issues such as the flight of labor from some NATO countries to others; the critical problems of inflation; unevenly distributed economic benefits within the NATO states; and uneven overall economic development among different regions of individual countries and as between some members of NATO as compared with other member states.

Besides these economic problems of grave importance, many NATO states have been contending with pressing problems of political stability. Some governments at times have been almost paralyzed because of the general inability of very shaky coalition governments and hence unable to take decisive and sustained strong action on the economic and social problems they confront. Among the NATO states there have been serious political tensions severely straining the cohesion and effectiveness of the organization.

It should be noted also that by 1970–71, when the CCMS was started, many other international organizations were engaged in research; in drafting model building codes and studying other measures directed at problems related to floods (and other water-caused disasters), earthquakes and other types of natural disasters. To be sure much more needed to be done, but it might be argued that it would have been better to have put the same resources that went into the NATO conference projects to work in the existing multilateral bodies or national research agencies already engaged in

studying these same problems. "Scatteration" of limited resources rarely, if ever, produces better results or more satisfaction of recognized needs.

Within individual NATO member states there also was a very wide range of ongoing research activity by 1970–71 on the three problem areas that the CCMS Disaster Assistance Program chose for its agenda. A reading of the two conference reports (especially the papers by government officials) shows how much was being done to better understand and better cope with the phenomena of flooding waters or earthquakes. Much more needed to be done to develop more precise prediction and more adequate warning capabilities regarding these phenomena but the use of NATO for such purposes was a questionable decision.

Looking back, one can see that the CCMS program on disaster assistance was conceived with the highest motives, that it pursued its goals with abundant vigor and commitment by many officials of several of the NATO states and by several members of NATO's secretariat, and that it achieved much of its stated objective (as outlined in the Rome CCMS meeting in March 1970) in a remarkably speedy fashion. What the subsequent impact of all this effort and structure has been is much more difficult to measure or to forecast.

In the course of many interviews with government officials in national governments and members of the staffs of international bodies (UNESCO, FAO and WHO), and numerous individuals in the private, voluntary relief agencies, I found a common opinion that NATO's entry into natural disaster relief activity was unnecessary, somewhat presumptuous and a further dispersion of resources for such work. The image of NATO as a military organization turned off some observers, especially those active in voluntary relief agencies.

Some government officials recognized a possible role for NATO in disaster relief but were irked by the repeated calls from NATO (or the pilot country) for reports on actions taken by their governments to implement the CCMS recommendations on flood control and reduction of hazards from earthquakes. They complained that their small bureaucracies could not keep up with the flood of NATO/CCMS recommendations for various actions and reporting on such recommended actions.

Will the efforts and zeal of those who produced the potentially helpful recommendations and guidelines for dealing with natural disasters be overlooked in the crush and crunch of more immediate and more pervasive economic and political crises? No one can answer for certain except much later in retrospect. Perhaps at this juncture one can best conclude that this NATO (CCMS) effort was well worth the making and the fruit of much labor is there for the using. Mayhaps, as with military preparedness, it is fitting to say of NATO's disaster preparedness efforts "It is better to be ready and not go, than go and not be ready." NATO at least is ready.

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THE COMPARATIVE STUDY OF DISASTER: A SOCIAL ORGANIZATIONAL APPROACH

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Disasters can provide an exceptional opportunity for the comparative analysis of social systems. Disaster events are particularly useful for comparative purposes since they activate a variety of structures and processes with which the social system attempts to cope. In addition, disaster events allow for the observation of complex intergroup and interinstitutional relationships which in "normal times" usually emerge more slowly and segmentally. Such complexity is often slighted in most other comparative research since methodologies are used which place a premium on precision and abstraction rather than on the real complexities of social interrelationships. Disaster events are also useful for comparative purposes not only in understanding the more immediate adaptation of social systems but also because they are significant in understanding long-range social change.

These possibilities, of course, have not been achieved. A number of factors explain this. First of all, the volume of social scientific research on disaster is quite small. Secondly, people working in the area often have become involved in such research "opportunistically". That is, they do one study because of their geographical proximity to a disaster event (e.g., Belshaw, 1951, and Pundalik and Patwardhan, 1962). Such an opportunity is not likely to occur a second time in another context. Thirdly, few people have maintained continuous interest and capabilities in disaster research which would move toward comparative analysis. Fourthly, there are certain restraints of timing and predictability of disaster events which militate against a comparative research design. Fifthly, the majority of the disaster research has been done in the United States and this "dominance" provides the opportunity for internal comparisons but seldom for cross-cultural comparisons. There have been a few studies which made comparisons by contrasting their own research in one society with their knowledge and awareness of previous research in other societies. For example, Lessa (1964), in his study of the effects of a typhoon in Ulithi (a Pacific island), makes explicit reference to the disaster literature in the United States. Such references, however, are more often done to indicate the sources of ad hoc explanations for the results which were obtained rather than to indicate either continuities or comparisons with other studies (see also Anderson and Whitman, 1967, and Wettenhall and Power, 1969).

STUDIES WITH EXPLICIT COMPARISONS

Only two studies have involved explicit comparisons. Roy Clifford (1956) focused on the difference in reaction and response to a flood which affected two communities, one in Mexico and the other in Texas, the United

States. Clifford suggested that the Mexican community tended to share certain characteristics with other Latin American countries. Among these characteristics were (1) a greater emphasis on ascriptive criteria, such as age, sex, class, and kinship in ordering social relationships; (2) a greater emphasis on personalized relationships; and (3) a greater dependence on people rather than positions. Consequently, Clifford found that in the Mexican community there was a greater dependence on the kin group as a source of advice and help. There was a greater reluctance to accept "official" warnings and aid. There was a greater resistance to cooperative relationships among disaster-related agencies and a greater tendency to depend upon "heroic" personalized leadership rather than on "rational" authority and cooperation. Clifford suggested that these differences in the nature of the social relationships had important consequences for the disaster response in the respective countries. Some of these suggestions we will build upon in the analyses here.

The other study involving explicit comparisons was McLuckie (1970 and his article in this journal). He looked at disaster response in three different societies – Japan, Italy, and the United States. These three societies are very similar on a number of demographic, economic, and political variables. In addition, the three societies are subject to similar types of disaster events. The societies, however, do differ in the degree of political centralization – Japan being highly centralized, Italy less centralized, and the U.S. with the least centralization. In each society, McLuckie looked at three different disasters – one earthquake and two different floods. One flood and the earthquake occurred in cities and the other flood centered in a rural area. All of the areas studied were some distance from the national capitals.

By matching as many variables as possible, McLuckie was able to observe the consequences of political centralization on the performance of disaster tasks. There were indications, for example, that in the more centralized societies, preventative actions involving warning and evacuation were often delayed. Established patterns of decision making which traditionally involved "higher" authorities made it difficult for local officials to make decisions, even though they had a more realistic assessment of the situation. McLuckie also found that the response to disaster tasks which had immediate priority tended to involve less centralized decision making, regardless of the social structure. In addition, he found that the degree of centralization in decision making did vary along the time sequence of the disaster event. For example, the effect of centralization tended to be minimized in the initial stages when high priority tasks were involved but its importance was reasserted in the later stages of disaster activity.

Both the Clifford and McLuckie studies were unique attempts to overcome difficulties inherent in comparative research. Clifford's work was a good example of utilizing an opportunity for research. McLuckie attempted to match similar events and similar social contexts while allowing a theoretically important variable – political centralization – to vary. There are, of course, many other variables which cannot be controlled when creatively utilizing opportunities or even by judicious matching. This would suggest that other attempts to generate comparisons are necessary.

OTHER POSSIBILITIES FOR PSEUDO-COMPARISON

Certain gains in comparative knowledge might be gained by classifying the existing research according to certain categories which might not be explicit in the original research. For example, the available research does focus on rather consistent levels of behavior, either individual, group, organizational, or societal. Another form of classification might be to order the research according to the disaster tasks with which the behavior is associated –

e.g., medical care, security, search and rescue, etc. Also since disasters are events which take place over time, the behavior which occurs in various time phases could be used as a basis of classification, e.g., warning, rehabilitation, etc. Using these dimensions for classification, certain comparisons might be made even when studies appear to be quite dissimilar. For example, Young (1954) examined the role of the family in the evacuation process during the threat and pre-impact period of a flood in England. By contrast, Brahme and Gole (1967) looked at the role of municipal and other governmental agencies in Indian mass care during the immediate aftermath and in the establishment of rehousing during the longer-term rehabilitation after massive floods. Dynes, Haas, and Quarantelli (1964) examined the organizational response to a variety of disaster-related tasks within the post-impact period of a Japanese earthquake, and Quarantelli (1970) does this also for a dam overspill in Italy. Such attempts at classification could result in the gradual accumulation of research findings drawn from the comparative context. However, for knowledge to accumulate, such a format places a premium on the accidents of research overlap rather than on other strategies which could also provide more consistent comparisons.

COMPARISONS BASED ON SOCIAL ORGANIZATIONAL SIMILARITIES

Another type of comparison can be made by combining findings from existing research with extensive inference concerning the nature of social organization. When research is limited, there is a tendency to be overly impressed with differences, in particular cultural differences. In dealing with such unique events as disasters in so many different and "unusual" locations, there is a tendency for researchers to emphasize such differences and to slight similarities. Such a tendency can be reversed somewhat if the focus is on social structure, rather than cultural variations. The range of possible variations within social structure is restricted. Thus, it is possible to select variations of social structure within which to examine disaster-related responses. Here we attempt to illustrate the organizing possibilities of such a typology.

Three types of societies will be utilized here. While these types are based on actual societies, what can be derived from this classification can also be extended to a larger number of empirical societies which exemplify the types. In each of these three types of societies, we will assume as a constant a disaster agent which has relatively sudden onset and which has impact of a rather wide scope. The specific kind of disaster agent, e.g., flood, hurricane, earthquake, etc., is of little significance here since our focus will be on the social structural implications of the agent. In particular, the major concern here will be on the problems of response to the disaster agent. Response will be considered, not at the level of the psychological reactions of individual members, but at the level of the social organizational implications within these types of societies. Below is a brief description of the three different types and, in organizing the subsequent discussion, it is useful to attempt to state the central organizational problem which each of these three types of societies has to cope with subsequent to a disaster event.

Type I societies: Type I societies generally have a small population, an economic base dependent on food gathering, and a social structure centered around kin and clan relations. Such societies have a "fragile" social structure built on a tenuous ecological base. Such a base does not contain the resources necessary to adapt to the extensive disruption which disasters of wide scope can bring. The adaptation necessary for compensating for these lost resources necessitates modifications within the social structure which lead to further change within the society.

Type II societies: These societies are larger in population and have an economic base of

agriculture plus some initial industrialization. They are family and village based, within a newly emerging political state. In these societies, the traditional forms of social organization, the family and village, are limited in their potential in replacing resources which may be affected by disaster events. At the same time, the state is unable to mobilize its more superior resource potential in a way in which the "local" problems can be solved. Thus, there is poor articulation between the various levels of social organization within such societies.

Type III societies: These societies have a large population sustained by an urban industrial base. The structure of the state is quite elaborate, assuming many of the functions previously performed by the family, kin groups and village in the other two types of societies. In these societies, there is a broader ecological base and a greater complexity of social organization. Such complexity, however, creates its own problems. The articulation of the various elements which are necessary to sustain life requires complex forms of coordination particularly to accomplish tasks which occur infrequently. In such societies, the complexity of social organization is both the key to the response and the key to the problem for which the response is needed.

Each of the three types of societies will be discussed in greater detail below. While none of the existing studies has been explicitly conceptualized in the way just described, certain "findings" from these studies will be cited as they contribute support to the overall scheme.

Type I Societies

It would seem that disaster impact in Type I societies is exceptionally traumatic since such societies are based on such a tenuous ecological balance and possess such a "fragile" social structure. Such societies possess such a delicate relationship to the environment that when it is disturbed, the whole social and cultural structure is threatened. For example, if the economy is based on food gathering and if the food supply is disturbed, this has repercussions throughout the society. The kinship structure which provides protection from routine threats does not have the resources necessary to cope with such problems. It seems likely that if accurate historical records of such societies were available they would show that many such societies have ceased to exist as a result. Those that have survived have more than likely done so by migration. Nomadic peoples have been able to adapt to marginal resources as well as the periodic destruction of a certain portion of them by "natural" forces. Nomadism is most effective when there is free access of movement. But such movement has great risks when nearby lands are occupied and controlled by others. With the growth of the political state with its boundaries marking the scope of authority, such adaptation by migration has become less and less possible.

In addition to these limits, many Type I societies tend to be somewhat isolated and thus have few hinterland resources on which they can depend in the event of localized destruction. Three of the studies which have been done have focused on island societies. Widespread local destruction on these islands and on nearby islands created the conditions whereby assistance had to be sought from considerable distances (Firth, 1959, Schneider, 1957, and Lessa, 1964).

Since such societies lack the aid of sophisticated detection devices on which warning of threat could be based, there exists a considerable amount of folklore and folk knowledge about weather-related cues which are utilized in potential threat situations. This suggests that preventive responses are likely to be quite rational, given the low level of technology and the limited alternatives such peoples have for action.

In the immediate post-impact situation, some observers have suggested that the immediate response to damage in the society can be viewed

(by a Western observer) as being rather apathetic. Such "apathy" or "aimlessness" is more likely to be culturally patterned. Since the "normal" pre-disaster activity is rather leisurely, the disaster event does not change it significantly. Since the continuity of life does not depend on any one element, there is time to accomplish what needs to be done. In these societies there is not much "effort" expended in the normal day-to-day activities, and after disaster impact, the tasks created are not seen as constituting an "emergency" but as something which will be accomplished in "good" time. Spillius (1957) suggests that in the aftermath there is no significant increase in the amount of cooperative activity evidenced within the society. What little emerged was directed toward certain sacred obligations – i.e., repairing the temple area, or toward political ends. The impression one derives is that the patterns of social organization which existed prior to the disaster event persist in post-disaster behavior. Too, the behavioral responses to danger and to the immediate emergency period tend to be rational within that cultural context. While the response may be more passive than many Western observers believe necessary, a more "active" response tends to be inhibited by the limited resources which such societies have.

One of the more interesting possibilities is that disaster impact may elicit significant social change within Type I societies. Prior to impact, such societies have developed a social structure on the delicate ecological base. When this base is destroyed or seriously affected, there are serious implications for the social structure. The "solution" by migration is becoming less and less a viable option. This means that the society must become dependent on resources from outside. This usually means a greater dependence on market economics rather than the traditional economy. In some instances, this might mean the temporary migration of elements of the population, especially young males, to accept wage work at some other place. In other instances, it means the greater dependence of the members of the society on "outside" political authorities, usually neo-colonial ones.

This increase in economic dependence on "outside" forces in turn has political consequences. In such societies, the existing leadership pattern is usually one which places a premium on traditional skills. In the reorientation necessary to stabilize the post-disaster consequences, those individuals who have greater knowledge of the "outside" world and who have skills valued by the "outside" world tend to assume leadership roles. Such individuals, in the acquisition of the knowledge and skills which make them valuable now, have often been previously considered "outsiders" to the leadership structure. But the old leadership structure no longer has the instrumental skills necessary to effect the necessary adaptation, and new leaders emerge.

In addition to the internal structural changes which evolve, there is also some indication that disaster impact facilitates in other ways rather rapid modernization. Since change can only go one way, there are suggestions in the literature that disasters provide a context in which new innovations can be introduced in a rapid fashion. Spillius (1957) reported the rather rapid adoption of certain items of clothing, based on the rationale of being useful in the post-disaster period. Shoes, for example, were justified on the basis of protection from dangerous debris which had been blown up by the typhoon. In addition, certain types of new materials began to be used in housing "repair". This impetus for change in these situations is in contrast with what happens in other types of societies. Perhaps the basis for change is something as follows: the fewer the societal resources, the greater the destructive potential of any disaster event. Given the greater destructive potential, the magnitude of the loss within such a society necessitates the greater utilization of "outside" resources. The necessity, then, to utilize extensive outside resources moves the society toward change. Since the previous

cultural and social adaptation has evolved over a long period of time and is based on these delimited resources, the degree of flexibility inherent in the adaptation is not sufficient to cope with any significant, long-term modification in the base. Thus, new cultural elements have to be introduced and used to make this continuum adaptation. If they are introduced, they will constitute significant social and cultural change. If they are not, the continued viability of such a society is problematic.

One temporary adaptation which such societies can make is the development of a disaster subculture (Wenger and Weller, 1973). If a disaster subculture is interpreted as a set of attitudes and values toward disaster impact, these societies are characterized by such. On the other hand, societies with such limited resources seldom extend their disaster subculture to include organizational and technological adaptations. Because of this, it leaves them vulnerable and subject to the possibilities of change induced by their necessary dependence on outside resources.

Type II Societies

As we have already suggested, there is a lack of articulation between the major social units within such societies – the family, extended kin groups, and the village – and the major source of power and resources, the central government. In such societies, the village has functioned as the historic center of social organization. However, these villages are being increasingly caught up in the linkages to the national government. The ties to the national government may, however, be more political and emotional than administrative. Often such societies lack the organizational ties which link the thousands of villages and their problems to the national level administration.

In such societies, a disaster agent may affect the resource base of one segment. While the "total" society may possess sufficient resources to cope with the problem, there are a number of barriers which intervene. In such countries, local governmental agencies are likely to be relatively powerless and ineffective. In the development of the national government, the bureaucratic structure which has developed to overcome kinship bias and pressure is so rigid that it is ineffective in dealing with non-traditional problems. Local officials have little autonomy in making decisions. Their primary functions are to follow rules which are made for them at the national level and which allow no exception for local conditions. If the problems do become standardized and routinized, such bureaucracies may be able to carry out longer-term rehabilitation tasks with efficiency but, in the immediate post-impact period, such structures seem to be singularly ineffective. In addition, there are limited possibilities for the assumption of local governmental responsibilities by some other source. Some disaster studies, especially Prince (1920), have described how "latent" power structures, usually a business elite, within given communities, emerge to play a significant role in the aftermath of disaster, particularly in those situations where local government proves to be ineffective. In Type II societies, however, the other institutional sectors, including the economic sector, seldom contain the personnel or resources to be able to accomplish such a substitution. In other words, there is structural "weakness" across the various institutional sectors.

There seem to be two rather common "solutions" to this problem of the weakness of local structure and the lack of articulation with the national level. The first solution is the military one. In Type II societies, the army is often the major governmental unit which has resources, mobility, and flexibility. In addition, in kin-dominated societies, the military tends to be the closest approximation to a rational bureaucratic structure within the society. As such, the military can move in, organize tasks and allocate resources. It is our impression that questions of authority in such

situations are seldom raised since the military act as a representative of the national government. The second solution, which sometimes can be combined with the first, is the possibility that a charismatic leader or a paternalistic one can reorient the existing structure so that it becomes relatively effective. This often is achieved by the physical presence of the charismatic leader in the disaster area for a period of time during which he delegates personal responsibility and assigns tasks to particular governmental units. These units then can function more effectively with the derived authority given to them. Clifford (1956) describes a similar situation in Mexico when the effectiveness of organization was enhanced by the actions of paternalistic leadership. This suggests that when rational bureaucratic organization is not well institutionalized within a society it can be "supplemented" by charismatic leaders to make it more effective.

The relative ineffectiveness of governmental structures has other consequences within Type II societies. Without the technological base available within Type III societies, such as widespread availability of various media, warning becomes more difficult. In addition, "official" warnings are likely to be less believable since governmental sources are often given little credibility. In addition, the issuance of "official" warnings is likely to involve a process in which various governmental agencies are likely to attempt to "share" responsibility so that later they can share the "blame". Such equivocation, delays in the issuance of warning, the lack of credibility given to such warnings, and the limited means for rapid transmission, combine to make the warning process ineffective.

The evidence suggests that, in the response to an emergency such as disaster impact, members of Type II societies tend to behave in the context of their social roles. The primary acting unit is the family and the exercise of authority tends to occur within the family context. Carroll and Parco (1966) reported that, subsequent to a volcanic eruption in the Philippines, over 90 percent evacuated as family units. In addition, these units often absorbed unattached persons as a form of mutual aid. Only one percent evacuated as individuals. These actions were primarily self-initiated and only 11 percent had any contact with public authorities. In addition, most of the family units were able to make their own arrangements for emergency shelter, although it was estimated that 15 percent did have to depend on governmental shelters. The extent of the kin assistance would vary, of course, with the magnitude of disaster impact and with the location and resources of other family members. Brahme and Gole (1967) reported that in a flood in an urban area in India, lower class families did not receive much assistance since members of the kin group within the area were similarly affected while other members were too far away to be of assistance. In any case, behavior immediately prior to impact and in the emergency period tends to occur within the context of conventional roles, particularly family roles. The images which are sometimes drawn of widespread irrational behavior or of apathetic dependent behavior do not seem to be revealed in the research literature.

In rather sharp contrast to Type I societies, disasters in Type II societies do not seem to be significantly related to any long-term social changes. Patterns of behavior which have developed over a long period at the family and village level are not likely to be significantly modified subsequent to disaster impact. In addition, the resources and the organizational capacity of the national government are tenuous enough so that the additional resources and their allocation are likely to have significant effect only in the immediate restoration. However, in such societies, it is common to see the handling of disasters become a political issue. Often parties out of power seize on the difficulties of coping with disasters as a major criticism of governments in power. Such

criticisms are more likely to reveal the nature of politics within the country than the level of effectiveness of the governments in power. If the parties out of power do gain power, they will often be subjected to the same types of criticism in subsequent disasters without any significant change in the performance levels of units within the governmental structure.

Type III Societies

One might suggest that in Type II societies, the major difficulties emerge from the "gaps" within the social structure which make the reallocation of some resources difficult. In Type III societies, the major problem is in the coordination of the parts of a complex social structure in attempting to cope with "non-routine" problems. The proliferation of structures as a result of specialization within such societies means that greater attention has to be given to the problem of coordinating the various parts essential for a disaster response. The family and the village continue to exist, but families in urban areas are now "assisted" in day-to-day living by schools, hospitals, stores, police departments, sanitation departments, etc. These organizations, of necessity, become involved in disaster activities. Furthermore, disaster creates problems, such as search and rescue or mass shelter, which are "unusual" in the sense that existing structures seldom consider these as institutionalized responsibilities. Added to this complexity of social organization, in Type III societies another social unit has been "added" which increases the complexity. This is the emergence of the "individual" as distinct from the family. This necessitates thinking of masses of individuals as well as constellations of family units.

While in other types of societies, the absolute lack of resources may be significant, the productive capacity of Type III societies is such that adequate resources are most likely available. In fact, a much more likely problem in areas of disaster impact is controlling the acquisition of irrelevant resources and preventing the overabundance of resources. A number of researchers have illustrated the problems created by convergence. Convergence is the concentration of goods, communication, and personnel in the immediate impact area. Usually these resources are already available within the impact area so that any addition simply causes added problems rather than solving existing ones.

The major problems in Type III societies center around the allocation of resources and the determination of the priority of tasks. The reason that this becomes problematic is that in most political units which may be affected by disaster impact, there is usually no overall decision making process which incorporates the elements which have the resources and capabilities to cope with the problems which disasters create.

One by-product of complex differentiation within these societies is the delimitation of responsibility and an increase in individual organizational autonomy. In disaster, however, interdependence among the various parts becomes evident again. The necessity for the extensive involvement of various organized parts of the political units and the fact of their interdependence necessitates a greater degree of coordination than has previously been exercised. The involvement of a wide range of organizations brings together those of quite divergent bases of authority and jurisdiction. It is likely to involve local, state, regional, and national levels. It is likely to involve governmental and private organizations. It is also likely to involve organizations with competing or overlapping domains. In addition, there may be "new" tasks created by disaster impact which no organization readily accepts as a part of its current domain. In other words, there may be "gaps" in the structure. These gaps may have to be filled by the development of emergent groups, which subsequently create additional problems for coordination.

Given the complexity of involvement and the high probability that many of the involved parts have had little experience together in

previous situations, coordination then becomes problematic and takes time to develop. The development of coordination can be facilitated in a number of ways. Repetitive experience with similar tasks provides a solid base upon which to start. Political centralization can resolve many potential jurisdictional and level problems. On the other hand, political centralization may delay the speed of decisions since time is necessary to accumulate evidence to be used in higher level decisions. In addition, this reduces the flexibility of those at the disaster site in taking into account localized conditions. It seems clear that no particular political system solves these problems easily. On the other hand, there are suggestions that flexible governmental administration is particularly effective since it allows local level officials some degree of autonomy in decision making and in the initiation of action.

The greater individualism within Type III societies creates a new set of problems. For example, the usual separation of job, school, and housing often results in family members being separated when disaster impact occurs. In those situations where the job is important in the emergency response, this can pose problems of role conflict, pitting occupational against family obligations. In addition, there are in Type III societies a larger number of persons not living in family units. These persons, thus, are removed from mutual assistance within family units. However, families in Type III societies usually have more resources, both of an interpersonal and of a material nature, which reduce their dependence on other agencies. The kin group continues to play a key role in the assessment of danger and of the advisability of evacuation. In addition, most individuals depend on family groups for shelter and accept alternative arrangements by "official" groups as a last resort.

The greater material resources and technological sophistication which are available within Type III societies have consequences of several different kinds. In certain communities a disaster subculture may develop. In addition to the values and attitudes which exist in other types of societies to cope with the consequences of disaster, in Type III societies planning can also be developed which facilitates the mobilization of organization and technology for a more rational response. In addition, the advanced technology can provide many useful tools for mobilizing a response, such as the availability of media which can reach mass audiences and deliver warning messages. On the other hand, a complex technology has its own vulnerabilities. For example, many organizations which are necessarily involved in emergency actions may be operationally dependent upon the continuity of certain technological necessities. Hospitals may be dependent on a constant power supply in order to cope with injuries generated by the disaster agent. Any loss of power will then lower operational capacities of these organizations. Too, the widespread dependence on technology in Type III societies creates a climate whereby problems are often "solved" by the addition of new technology. Technology thus becomes a panacea. If a communication problem exists, it is more likely to be remedied by the addition of a telephone than by the analysis of the nature and the destination of the message. Because of this dependence, disasters are an impetus to continued technological development.

In general, however, in Type III societies, disasters seem to create little change. At times, some groups that have emerged during the emergency to cope with a specific problem may be institutionalized. Within existing organizations, there may be some post-disaster continuation of forms of organizational adaptation initiated in the emergency period. In certain situations, the volume of resources which were brought to bear on disaster impact may be sufficient to provide impetus to economic growth. But overall, the amount and degree of change within Type III societies is minimal.

In addition to the lack of change, the emergence of political criticism is also limited. The more effective function of the administrative bureaucracy in the disaster response tends to limit the possibilities for criticism. In addition, the less dependence on personalized leadership in Type III societies and the greater elaboration of bureaucratized and rationalized forms of social organization tend to deflect criticism.

The problems of the lack of articulation between the various parts of a complex society is somewhat confined to the immediate post-impact period. It is in this period that the complexity of the society is most evident and, in addition, the scope and variety of tasks which have to be solved by organizations is greatest. In most Type III societies, "small emergencies" such as fires, traffic accidents, and crime, are an integral part of everyday life. Not only do organizations such as fire departments and hospitals develop to cope with these "normal" emergencies, but they develop types of understanding with each other which facilitate cooperation. A major increase in the scope of emergency, such as is created by a diffuse disaster, of necessity brings a more extensive involvement which goes beyond the existing understandings. On the other hand, in the longer-term recovery period, time and the reduction of the pressures of immediate emergency problems allow for the development of cooperative arrangements. This suggests then that the most problematic period from the social organizational vantage point in disaster response is the immediate post-impact period.

SUMMARY

The existing research dealing with the response to disasters has been viewed in terms of the structural problems which are experienced in three different types of societies. Here, disasters have been seen as presenting demands for "solution" by a delimited number of types of social systems. In Type I societies, a very fragile social structure is erected on a tenuous ecological base. The effects of disasters can often be very disruptive of existing social relationships. Because these disruptions are often impossible to "repair," adaptation and change within the structure is often the only alternative. In Type II societies, the structural problem resides in the poor articulation between the family and village structure where disaster impact is felt and the superior resources of the national, political, and governmental structure. Often the political units find it difficult to mobilize their superior resources in a fashion which facilitates coping with the disaster at the local level. In Type III societies, there is the growth of structural complexity, involving the elaboration of governmental structure, the development of voluntary associations, and the emergence of individualism. Emergent groups often appear in response to "gaps" within the structure. There is complexity in the bases of authority for various elements. All of this provided the base for problems of coordination, particularly in the immediate post-impact period. In general, coordination mechanisms are adequate in the threat and rehabilitation periods but they have not been developed to cope with the complexities of the immediate post-impact period.

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IT'S A MATTER OF MYTHS: AN EMPIRICAL EXAMINATION OF INDIVIDUAL INSIGHT INTO DISASTER RESPONSE*

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> One of the major contributions of the last twenty years of disaster studies both qualitative and quantitative has been the exposure of widely held stereotypes as untrue, through careful observation and interviewing. We at least know that certain things that both the public and the experienced professionals in the field believed – such as the generality of panic, "shock," anti-social behavior – are *not* true.
>
> A. Barton (1970: 61)

> Disasters have always been the basic ingredient of human dramas ranging from religious epics and Elizabethan tragedies to newspaper stories and grade-B movies. They capture the imagination and provide a vivid backdrop for speculation on the significance of man. . . Late-show scenes of panic-stricken mobs fleeing animal-like before an advancing threat become the stock footage of our own dreams and nightmares. Newspapers photograph the dazed victims of hurricanes, floods, and earthquakes. Disasters have become a reliable source of tragedy, and human-interest stories.
>
> How accurate are these dramatic accounts of people in emergency situations? Since 1963 the Disaster Research Center at Ohio State University has studied nearly 100 different disasters and reviewed all earlier studies of other researchers. . . We found that most persons held preconceived notions about disaster behavior that were essentially untrue.
>
> E.L. Quarantelli and R. Dynes (1972: 67)

These observations are founded upon the rather extensive literature that focuses upon social behavior during natural disaster situations. Since World War II hundreds of disaster events have been studied by social scientists. These studies have led investigators to note that many common beliefs and perceptions about disaster response and post-impact behavior are not empirically valid. In general the conclusion has been that both the public and officials of emergency-relevant organizations possess beliefs about such disaster behavior as panic, looting, martial law, evacuation, and crime that evidence little insight into actual disaster behavior. In other words, myths about natural disasters are widespread.

It must be noted, however, that these observations are based upon either direct observation of disaster behavior or information obtained from interviews with officials in emergency-relevant organizations. As they relate to actual disaster behavior they appear to be accurate. However, these observations go beyond simply noting what actually occurs during a disaster event. They also present conclusions about the "public's" beliefs and perceptions about what occurs. To our knowledge, however, there has never been a systematic, empirical study of the disaster beliefs and

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perceptions of individuals drawn from a non-victim population existent within an area that does not experience recurrent disaster. Surveys of disaster victims have been undertaken (for example, see Drabek and Key, 1972; Form and Nosow, 1958; Ikle, 1958; Marks and Fritz, 1954; Moore, 1958; and Taylor et al., 1970). In addition, at least one study has sampled residents from the populations of disaster subculture communities in order to determine their knowledge of appropriate and effective disaster behavior (see Osborn, 1970). However, no survey has been undertaken of a non-victim, non-subculture, population during a non-crisis period; i.e., no study has attempted to ascertain the degree of insight into disaster behavior actually held by "most persons" or the general "public". The results of such a survey will be presented in this paper. In effect we will attempt to determine if the public actually does exhibit the lack of insight and acceptance of myths about disaster response that has been attributed to it by numerous investigators.

As such, our task is fairly simple. We will present the results of an opinion and belief survey undertaken with a random sample of the population of New Castle County, Delaware. Our primary interest is in documenting the degree of insight into disaster behavior held by these individuals. In addition, we will consider briefly a few other issues. First, we will examine the extent and nature of disaster experience held by these randomly selected individuals. In so doing we will determine what percentage of the respondents has had experience with natural disaster, and examine the types of disaster situations involved. Second, the nature of the sources of information about disaster response that is salient to the respondents will be examined. We will determine the degree of saliency to these individuals of such sources of information as the electronic media, newspapers, movies, direct experience, and books. Finally, we shall briefly discuss a preliminary attempt to analyze factors that might differentiate those individuals with high insight into disaster response from those who espouse various disaster myths.

Let us note what we are *not* doing. We are not presenting data relevant to actual disaster behavior or the degree of occurrence of such phenomena as panic flight, looting, or "disaster shock". We accept and have no reason to doubt the accuracy of those investigators who have examined these behavior patterns. We are concerned, however, with the beliefs and perceptions of a randomly selected sample of respondents about these phenomena.

Let us now turn to a discussion of various "disaster myths". Our discussion will not be exhaustive, but will focus upon some of the more common stereotypes. The discussion will be based primarily upon, though not limited to, the recent treatment of the subject by Quarantelli and Dynes (1972).

DISASTER MYTHS

Panic Flight

Numerous investigators have observed that panic flight (i.e., the competitive mass behavior of individuals involved in fleeing from an imminent threat that results in increasing the danger to themselves and others) is rare in natural disaster situations (for example, see Barton, 1970; Dynes, 1970; Janis, 1951; Quarantelli, 1954 and 1960; Quarantelli and Dynes, 1972; and Wenger and Parr, 1969). Only in unique situations are the conditions necessary for the emergence of competitive norms and the existence of panic flight present in natural disaster. (See Fritz and Williams, 1957, and Turner and Killian, 1972 for a treatment of these conditions.) Popular and journalistic accounts of panic flight often involve a large dose of literary license in reporting orderly evacuation. As Barton notes, "All these authors come to the conclusion that the rate of extreme non-adaptive behavior in disasters is generally very low, even in impacts as intense as the Hiroshima atom bombing" (1970: 146).

It has been offered, however, that "the most widespread myth about disasters is the belief that people will panic in the face of great danger" (Quarantelli and Dynes, 1972: 67). It has been inferred that most individuals espouse this belief due to its perpetuation through the mass media. Popular film portrayals of mass behavior in the face of imminent threat picture "crazed hordes" fleeing from the approach of such varied phenomena as tsunamis, fires, earthquakes, floods, nuclear holocaust, meteors, flying saucers, triffids, Grog, Kronos, and Godzilla. As noted, news accounts often either erroneously report panic flight or may be interpreted by the audience as indicating such behavior. In this study we will examine the degree to which randomly chosen respondents agree that panic flight is a major problem in natural disasters.

Looting Behavior

Looting, the appropriation of private property for private use, has been found to be rare in natural disasters (see Marks and Fritz, 1954, and Quarantelli and Dynes, 1970). Studies from the Disaster Research Center report that there are few verified cases of looting in the field studies of disasters (Wenger and Parr, 1969: 76). Dynes and Quarantelli (1968) have presented an analytical explanation for the small degree of looting in terms of the emergence of communal property norms and norms encouraging altruistic behavior.

However, it has been posed that most people believe that looters pour over a disaster site pillaging the homes and businesses of the victims. Disaster victims themselves have been found to readily accept and report rumors of looting (Quarantelli and Dynes, 1972: 69). Once again, the existence of these stereotypes may be at least partly explained by the dramatic picture of post-impact behavior presented in movie and television versions of fictional disaster. In addition erroneous news accounts often report rumors of looting *as* looting, or note that social control provisions to protect against looting have been instituted, without reporting that no looting has occurred. Furthermore, since looting has been so widely publicized in civil disturbances, one might infer that individuals will believe that it is common in other, superficially similar, community emergencies. In this study we will determine the extent to which our respondents believe that looting is rare in natural disasters,

Martial Law

As Quarantelli and Dynes note: "Widespread belief notwithstanding, no one has ever declared martial law in a disaster area in the United States. Press reports of martial law inevitably turn out to be entirely false or incorrect descriptions of limited emergency power usually given to local police by mayors or city councils – usually to bar sightseers. In no way do such actions imply or involve cessation of regular civilian authority in the area" (1972: 69). Apparently American values favoring civilian control over the military are very strong and enduring, even in the face of local crises. Once again, however, it is posed that individuals are probably unaware of this fact due to sensational reporting of disaster events, or the simple assumption that martial law must be established in disaster situations to control the non-social behavior of the victims and those who come to exploit their condition.

Post-Impact Crime Rates

Studies from the Disaster Research Center have found that the crime rate of a community usually drops during the emergency period of a disaster (Quarantelli and Dynes, 1972: 69). While one could argue that fewer crimes are committed during the immediate post-impact period as a natural concomitant of the altered social system, it is more likely that the reduced crime rate is a result of altered law enforcement practices that result from changes in the value

priorities of the community. Misdemeanors such as traffic violations, drunkenness, and vandalism are ignored as the local social control agencies turn their attention to other problems, such as handling the massive human convergence that often inundates the disaster site. Normal law enforcement procedures are often altered as the resources and the attention of authorities are focused upon different tasks.

However, it has been posed that individuals hold a general belief that antisocial behavior is widespread in disaster situations. Therefore, it is inferred that they will generally believe that the crime rate normally rises during a disaster.

Evacuation

With respect to evacuation, Quarantelli and Dynes have observed that, "Even when an area is evacuated, the majority of inhabitants do not leave. Those who do flee are primarily transients and tourists – not the people who live there. . . It appears that the major problem in an emergency is getting people to move, rather than preventing wild panic and disorderly flight" (1972: 67–68). Many individuals refuse to evacuate areas until they are forced to do so either by the physical effects of the agent or the legal efforts of local authorities. In communities with disaster subcultures, this problem may be particularly acute as the residents have developed a defiant attitude toward the agent and often remain in their homes to "ride out the crisis" (Wenger and Weller, 1973).

One might expect, however, that members of the public would believe that when warned of an impending disaster, most people are quick to cooperate and evacuate the area. This belief would appear to be related to the opinion that panic flight often occurs prior to impact.

Disaster Shock

One of the most consistent findings of studies of disaster response is that the initial search and rescue activity, casualty care, and restoration of essential services are accomplished by the victims themselves with the assistance of those in the immediate, filter area. (For example, see Dynes, 1970; Form and Nosow, 1958; and Quarantelli and Dynes, 1972). Barton (1970) notes that the rate of non-adaptative behavior on the part of victims is low, only a few exhibit any shock reaction, and this state is usually short-lived. Actually, the immediate post-impact period is highlighted by intense activity, the emergence of new groups, and adaptative behavior. Empirical evidence does not support the idea that the victims are in a state of shock and unable to care for themselves.

However, Quarantelli and Dynes (1972: 68) state, "The common belief is that shock leaves the victims dazed and disoriented, unable to cope with the immediate task of recovery, dependent on outside help from the Red Cross". Dramatic news and human interest stories often portray the victim as a helpless creature, unable to care for himself and uncomprehending of his condition.

Red Cross

While the Red Cross is an important organization in disaster relief work in the United States and performs invaluable assistance to disaster victims, numerous investigators have noted a paradoxical finding: There is a great deal of resentment and hostility evidenced by disaster victims toward the Red Cross. Form and Nosow (1958), Marks and Fritz (1954), and Moore (1958) have all pointed to the existence of hostility toward the Red Cross. Barton (1970: 297–301) in analyzing the existence of this "anti-Red Cross syndrome" notes that the rationalistic approach of the Red Cross, its tendency to "oversell" its accomplishments, and its procedure of offering compensation on the basis of need versus loss, all work against its symbolic acceptance to the victims and foster resentment. Furthermore, the dual authority structure of the organization, its reliance upon outsiders to supervise local relief operations,

and its imperialistic stance *vis-à-vis* its domain all combine to give the appearance of a cold, bureaucratic, impersonal organization to victims. Quarantelli and Dynes note that the victims often see the organization as unsympathetic and insensitive to local problems and issues (1972: 70).

The Red Cross, however, has traditionally been viewed as *the* disaster relief organization. The message it conveys to the public is that when disaster strikes the Red Cross is not only there, but offers efficient, effective, equal aid to all. In this study we will determine the extent to which our respondents are aware of the resentment and hostility shown by disaster victims to the Red Cross.

Accuracy and News Reports of Disaster

It is evident that a major source of many of the myths about disaster response is the mass media. Quarantelli and Dynes (1972: 70) observe that media accounts are not very accurate with respect to conveying the extent of physical damage, human loss, or social disruption. Initial accounts usually overestimate the number of dead and injured. News films and photographs focus upon the destruction. As a result the audience is given a false impression of the extent of devastation. We have noted that myths of looting, panic, shock, and crime are often spread by the media. As noted by Quarantelli and Dynes (1972: 70), "Reporters have images of what should happen in disaster, and in the absence of contrary evidence they report these images". Part of this issue may be that news reports focus upon the unique events of disaster, but present them as if they were typical.

It would appear obvious that individuals with insight into disaster response would be cognizant of the inaccuracies and bias in news accounts. It is inferred by the investigators that most people believe the media accounts of disaster, however, and that this belief is a major factor in the perpetuation and spread of disaster myths.

Shelter Utilization

A consistent finding in the literature on disaster response is that of those individuals who evacuate their homes, the great majority do not use formally established shelters, but find shelter with friends, relatives, neighbors, or provide for their own lodging. (See Barton, 1970; Dynes, 1970; Quarantelli and Dynes, 1972; and Wenger and Parr, 1969.) Hotels, motels, and private homes provide the bulk of dwellings in the evacuation process. Normally, only about 10 to 30 percent of the evacuees go to formally established shelters.

It is inferred, however, that most individuals are not aware of this shelter pattern. Human interest stories and news photos often show the individuals in formal shelters, not in private homes and motels. Furthermore, the location of formal shelters is often a very salient item in local newspapers. In addition, the Red Cross and Civil Defense are quick to discuss and publicly note their shelter efforts.

Victims' Initial Search for Help

As Quarantelli and Dynes (1972: 68) note: "In general, disaster victims react immediately to their plight. Individuals first seek help from family and friends, then from larger groups such as churches. If these groups are unresponsive or unavailable, victims will look to more impersonal official organizations – the police and welfare departments. Only as a last resort will they turn to the special disaster agencies like the Red Cross or civil-defense organizations."

Form and Nosow (1958) concluded that the initial rescue work is done by individuals who are in the impact area i.e., the victims themselves, and that formal rescue organizations could not be expected to facilitate this task unless they enlist at least the passive cooperation of the population. Furthermore, this helping behavior seems to start with specific persons and moves to aiding others more generally. The usual pattern, however, is for disaster victims to

seek help first from family and friends, and only much later turn to special relief agencies.

It may be assumed, however, that most individuals are not aware of this pattern. Insight into this issue requires a level of knowledge of disaster ecology, search and rescue behavior, and relief agency operation that is fairly sophisticated in nature. Furthermore, the fund-raising campaigns of relief agencies obviously emphasize the important role they play in giving assistance.

Human and Material Convergence

The severe problems caused by the massive convergence of people and materials upon the disaster site have been admirably discussed by Fritz and Mathewson (1957). They (1957: 22–23) state that supplies of food, clothing, and materials: (1) normally arrive in volumes far far in excess of actual needs; (2) in large proportion are composed of unneeded and unusable materials; (3) require the services of large numbers of personnel and facilities which could be allocated to more essential tasks and functions; (4) often cause conflict relations among relief agencies or among various segments of the population; (5) materially add to the problem of congestion in and near the disaster area; and (6) in some cases, may be disruptive to the local economy. Barton (1970: 174–180) and Quarantelli and Dynes (1972: 68–69) also note this serious problem. In addition to materials, individuals also converge upon the disaster site. Sightseers, concerned friends and relatives, volunteers, agency personnel, and returning evacuees swarm over the disaster area. Their motivations are heterogeneous; however, their impact is to create problems of congestion and utilization.

This convergence pattern raises the question of effective public aid. What is the most effective aid the non-victim, general public can offer to disaster victims? It would appear that any form of aid which contributes to convergence, such as going in person to the community or sending supplies to the community, would not be as effective as sending money to relief agencies or similar acts.

To what extent are individuals aware of this problem? Due to mass calls for assistance that are often issued by officials at disaster sites, we may infer that most people believe that some form of aid should be given directly to the disaster area.

RESEARCH METHODS

The Setting

This report is based upon information obtained from a random sample of residents of New Castle County, Delaware. New Castle County has a population of approximately 400,000 and contains Delaware's two largest cities, Wilmington and Newark. The boundaries of the county are fairly coterminous with the metropolitan region of Wilmington

With respect to the racial and socioeconomic characteristics of the population, the county is predominantly white (approximately 85%), however, the city of Wilmington has a large black population. Due in part to the massive research centers of the Du Pont Corporation that are located within its boundaries, the county has a rather high socioeconomic status. The occupational and educational status of the area is high. Its income level is also one of the highest in the nation.

The disaster experience of the area is very limited. There has not been a major disaster in New Castle County in the past decade. The last major natural disaster to strike the area was Hurricane Hazel in 1956. Therefore, without the contamination of recent disaster experience, it would appear to be an excellent area in which to examine disaster myths held by non-victim respondents in a normal, non-disaster setting.

The Technique for Gathering Data

The telephone interview was used in this survey of disaster myths. The use of this technique was dictated because of constraints resulting from costs both in time and money. The authors are aware of the weaknesses inherent in the use of telephone surveys. However, the socioeconomic bias involved in this technique did not appear to have serious consequences for this problem. Furthermore, information was gathered on the education, occupation, and sex of the respondents in order to examine any possible bias. In addition, the universe from which the sample was drawn consisted of a total list of addresses for the county, not the public telephone directory. Finally, the nature of the questions and the primary focus of the study seemed uniquely suited to this technique.

The interviews were conducted by telephone over a two-week period by 39 interviewers. The interviewers were trained in telephone survey techniques and pretested these techniques on a purposive sample before actually conducting the the interviews. The authors verified the data by calling back approximately one-sixth of the respondents. Only one discrepancy was discovered, which appears to have been the result of a dialing error. The authors have confidence in the validity and relevance of the data for the problem at hand.

The Interview Schedule

The authors constructed a preliminary interview schedule based upon a list of myths surrounding individual and community disaster response. The previously cited literature provided the bases for this listing. This initial schedule was pretested in telephone interviews using a random sample of 43 respondents.

The final interview schedule included opinion or attitude statements about each of the myths previously noted. Furthermore, it included items that obtained data about the respondent's occupation, education, sex, disaster experience, and source of information about disasters.

The Sample

The Division of Urban Affairs at the University of Delaware maintains a listing of all addresses in New Castle County. This directory is updated annually for purposes of the division's census of the population. From this universe a random sample of 560 addresses was generated. Telephone numbers were obtained for this sample by consulting a cross-reference directory. This procedure resulted in telephone numbers being available for all but 34 of the addresses. Because of disconnected numbers which were discovered during the interviewing process, the sample size was further reduced. From the final sample of usable numbers, 354 interviews were completed. Of those individuals contacted by the interviewers, approximately 76 percent agreed to cooperate and were interviewed. For purposes of estimation from this sample to the population, the margin of error is 5.2 percent at the 0.05 level of confidence.

FINDINGS AND ANALYSIS

Characteristics of the Sample

Before considering the data related to myths, let us briefly examine the characteristics of the sample in three areas: (1) sex, educational, and occupational distributions, (2) extent and nature of previous disaster experience, and (3) source of information about disasters.

1. Sex, Education, and Occupation

Table I presents the distributions of occupation, education, and sex for the 354 respondents. It is apparent immediately that females are overrepresented in the sample. That 66.9 percent of the sample is female is probably a result of using the telephone to gather data. The educa-

tion and occupation dimensions, however, evidence greater diversity. The modal educational category is high school graduate. College graduates and those with graduate or professional training comprise 22.3 percent of the sample. Given the sex distribution of the sample, it is not surprising that private household workers make up the largest occupational category (136 respondents or 38.4 percent of the sample). In sum, the sample included a large percentage of females. The respondents have diverse educational backgrounds and varying occupational positions.

TABLE I

Sex, Education, and Occupation of the Respondents

	Number	Percent
*Sex**		
Male	114	32.2
Female	237	66.9
Total	351	99.1
Education		
Grade School	14	4.0
Some High School	50	14.1
High School Graduate	134	37.9
Technical and Trade School	20	5.6
Some College	55	15.5
College Graduate	50	14.1
Graduate or Professional School	29	8.2
Unknown	2	0.6
Total	354	100.0
Occupation		
Professional and Technical	46	13.0
Managers, Officials, Proprietors	13	3.7
Clerical	35	9.9
Sales, Service	36	10.2
Craftsmen (Skilled Workers)	21	5.9
Private Household Workers	136	38.4
Operatives (Semi-skilled Workers)	8	2.3
Farmers, Laborers	7	2.0
Not in the Labor Force	52	14.0
Total	354	100.0

*The sex of three of the respondents could not be determined

2. Extent and Nature of Disaster Experience

The respondents' extent and nature of disaster experience is presented in Table II. Seventy-five of the respondents, or 21.2 percent of the sample, stated that they had personally been in a disaster. However, one cannot assume that these self-reports indicate actual natural disaster experience. Thirty-one respondents claimed to have experienced a hurricane and 20 individuals offered that they had flood experience. A few individuals also claim to have experience with tornadoes or earthquakes. What should be noted, however, is that 12.0 percent of those claiming experience gave unique, idiosyncratic types of stress situations as examples of natural disasters. These did include one typoon and a tsunami. They also included such "natural disasters" as "war", "our house caught on fire", "my husband had a nervous break-down once", and "having six children". Apparently, the term "natural disaster" has a wide range of referents to members of the public.

TABLE II

The Extent and Nature of Natural Disaster Experience as Noted by the Respondents

	Number	Percent
Extent of Disaster Experience [a]		
Experience	75	21.2
No Experience	279	78.8
Total	354	100.0
Nature of Disaster Experience [b]		
Tornado	4	5.3
Bomb	3	4.0
Earthquake	2	2.7
Hurricane	31	41.3
Flood	20	26.7
Other	9	12.0
Unknown	6	8.0
Total	75	100.0

[a] Respondents were asked, "Have you ever experienced a natural disaster?"

[b] Respondents were asked, "What type of disaster was it?"

In sum while 21.2 percent of the sample stated that they had personal experience with natural disaster, only approximately 75 percent of the events could be classified as true natural disasters. Therefore, for over 80 percent of the sample there had been no salient experience with natural disaster. Furthermore, as previously noted, there have been no recent, natural disasters in this area. Therefore, it can be assumed that even for those with natural disaster experience, it is not a recent, salient event.

3. Salience of Sources of Information About Disaster

This assumption seems verified when one examines the sources of information about disaster response that are salient to the respondents. The respondents were asked from what sources they had obtained the greatest amount of information concerning natural disasters. The results are presented in Table III.

Only 6.2 percent of the sample noted direct experience with natural disasters as a salient source of information. There, while about 20 percent have had experience, it is only salient as a source of information for about one-third of them. For the vast majority of the respondents the electronic media (74.4 percent) and newspapers (63.9 percent) are not only the most salient sources of information about natural disasters, they are the only sources. We have previously noted that Quarantelli and Dynes (1972: 68–70) offer that the mass media are a major source of myths about disaster. For our sample, the exposure to and salience of this content is considerable.

TABLE III

Salience to the Respondents of Sources of Information About Disasters [a]

	Number	Percent [b]
Source of Information [c]		
Electronic Media	260	74.4
Newspapers	236	63.9
Magazines	40	15.3
Motion Pictures	2	0.6
Fiction Books	2	0.6
Non-Fiction Books	14	3.9
Discussion with Others	29	9.2
Direct Experience	22	6.2
Other	20	5.6

[a] Number of respondents totals 354
[b] Percents total more than 100.0 because respondents were allowed to mention more than one source of information.
[c] Respondents were asked, "From what sources have you obtained the greatest amount of information concerning natural disasters?"

Insight Into Disaster Response

Data pertaining to the respondents' insight into natural disaster response are presented in Tables IV through VII. In general it appears that the degree of insight held by these respondents is generally low; correspondingly, their espousal of disaster myths is high.

Table IV presents the attitudes and beliefs of the respondents with respect to the issues of panic flight, looting, martial law, crime, evacuation, disaster shock, the Red Cross, and news coverage. Lack of insight and espousal of myths are particularly high with respect to panic flight, evacuation, and the victims' view of the Red Cross. Over eight out of ten individuals believe that panic flight is a major problem in disasters, and that when warned, people are willing to cooperate and evacuate the disaster area. Less than 14 percent of the respondents evidenced insight into these patterns.

Only a small minority disagreed with the statement that the Red Cross has come to be regarded by disaster victims in the United States as a very helpful relief agency. Furthermore, the belief in disaster shock appears to be quite prevalent. A large majority of the respondents agreed that immediately following impact the victims are in a state of shock and unable to care for themselves.

With respect to looting and martial law the respondents evidenced only slightly greater in-

TABLE IV

Respondents' Beliefs About Disaster Response*

	Agree		Undecided or No Response		Disagree	
	Number	Percent	Number	Percent	Number	Percent
Panic [a]	296	83.6	22	6.2	36	10.2
Looting [b]	98	27.7	27	7.6	229	64.7
Martial Law [c]	61	17.2	80	22.6	213	60.2
Crime Rate [d]	180	50.8	51	14.4	123	34.7
Evacuation [e]	284	80.2	22	6.2	48	13.6
Disaster Shock [f]	261	73.7	25	7.0	68	19.2
Red Cross [g]	279	78.8	25	7.0	50	14.1
News [h]	193	54.5	35	9.9	126	35.6

* Respondents were asked to agree or disagree with each of the following items.
[a] A major problem community officials confront when faced with a natural disaster is controlling the panic of people fleeing from the danger area.
[b] Looting rarely occurs after the impact of natural disasters.
[c] Martial law has never been instituted in a disaster area in the United States.
[d] The Crime Rate of a community usually rises after it has experienced a natural disaster.
[e] When warned of an impending disaster, people are willing to cooperate and evacuate the area.
[f] Immediately following the impact of a disaster, the disaster victims are in a state of shock and unable to cope with the situation by themselves.
[g] The Red Cross has come to be regarded by disaster victims in the United States as a very helpful disaster-relief agency.
[h] The news media accurately portray the amount of devastation resulting from a natural disaster.

sight. About two out of three individuals disagreed with the statement that looting rarely occurs after the impact of a natural disaster. Furthermore, about six out of ten respondents believed that martial law must have been instituted somewhere, at sometime in the United States in a natural disaster, What is of particular interest here, however, is that over one-fifth of the respondents were undecided or unable to respond to the question. Martial law is apparently a vague term to many individuals. Although the term is often used in accounts of revolution and civil disturbance, a number of respondents stated that they did not know the exact meaning of martial law or requested clarification about its nature.

In Table IV the greatest insight is evidenced with respect to the crime rate. However, even in this instance the majority of the respondents espoused the myth that the crime rate usually rises after a community has experienced a natural disaster.

Finally, as one might expect, given the lack of insight shown in the above findings, a majority of the respondents agreed that the news media accurately portray the amount of devastation resulting from a natural disaster. However, a sizeable minority of the sample, 35.6 percent, disagreed.

The respondents evidence greater insight into shelter utilization than any other issue in this study. As noted in Table V, almost one-half of the sample correctly perceived that the majority of the people who evacuate an area go to the homes of friends, relatives, neighbors, or provide for their own shelter. However, approx-

TABLE V

Respondents' Beliefs About Shelter Utilization*

	Number	Percent
Perceive majority go to formal, public shelters	149	42.4
Perceive majority find shelter with friends, relatives, neighbors, or provide for own shelter	173	48.9
Undecided	32	9.0
Total	354	100.0

*Respondents were asked to complete the following statement: "The majority of the people who evacuate an area during a disaster go to: a) formally established public shelters, or b) the homes of friends, relatives, or neighbors or provide for their own shelter."

imately four out of ten individuals espouse the myth that evacuees go to formally established, public shelters.

Beliefs about disaster victims' initial search for help are presented in Table VI. Once again we can observe the rather extensive presence of a myth. Almost one-half of the respondents believe that victims first turn to the Red Cross, Salvation Army, and/or Civil Defense for help. However, about one out of three individuals evidenced insight into the predominant pattern.

TABLE VI

Respondents' Beliefs About Victims' Initial Search for Help*

	Number	Percent
Formal Organizations	168	47.5
Local Organizations	53	15.0
Family and Friends	115	32.5
Undecided or no Response	18	5.0
Total	354	100.0

*Respondents were asked to complete this statement: "The first place disaster victims turn for help is: a) special disaster-relief agencies such as Red Cross, Salvation Army, and Civil Defense, or b) local groups such as churches, welfare agencies, and service organizations, or c) family and friends."

Finally, let us consider what the respondents view as effective disaster aid. The respondents were asked what constituted the most effective aid they could personally offer to disaster victims. This issue is directly related to the problems of human and material convergence. The results are presented in Table VII. What must be noted is that over one-half of the respondents perceive that the most effective aid they can offer is in a form that will result in direct material or human convergence upon the disaster site! Thirty-six percent of the respondents state that they should send supplies or money directly to the stricken community, while an additional 17.5 percent offer that they would go in person to the community to help. In this instance one can only hope that perceptions and attitudes are not related to behavior! Even though we may assume that most of these individuals will not engage in these forms of "helping" behavior in an actual disaster situation, it is evident that there is a large proportion of the public whose attitudes and beliefs are such as to support the major problems of convergence noted in disasters. Local officials should consider these factors before issuing mass calls for aid.

TABLE VII

Respondents' Beliefs About Effective Personal Aid to Disaster Victims*

	Number	Percent
Send Supplies or Money to the Stricken Community	127	35.9
Go in Person to the Community to Help	62	17.5
Send Money to Disaster Relief Organizations	135	38.1
Do Nothing	12	3.4
Undecided	18	5.1
Total	354	100.0

*Respondents were asked to complete this statement: "What is the most effective assistance you as a concerned citizen can offer to the victims of natural disasters? Would you a) send supplies or money to the stricken community, b) go in person to the community to help, c) send money to disaster-relief organizations, or d) do nothing?"

In sum we note that these respondents do not evidence a high degree of insight into disaster behavior and response. In not a single

case do the majority of the respondents perceive or believe the predominant response pattern. With respect to panic flight, martial law, evacuation, disaster shock, and the victims' views of the Red Cross fewer than two out of ten individuals exhibit insight. Only in the case of shelter utilization do over four out of ten respondents evidence awareness of the predominant pattern.

Factors Related to Disaster Insight

While there was generally low insight evidenced by the respondents, and their beliefs and perceptions were fairly homogeneous, the attempt was made to examine factors that might differentiate those with greater disaster insight from those who espouse disaster myths. It was proposed that the degree of disaster insight evidenced by the respondent might be related to his or her sex, occupation, education, source of information about disaster, and previous disaster experience. It was assumed that greater disaster insight might be positively related to occupation status, years of schooling, and disaster experience. Furthermore, one's source of information and sex, due to sex-linked life style differences, might also be related.

In order to proceed with this analysis, each of the 11 items relating to disaster myths was transformed into a three-point scale evidencing low, moderate, and high insight. Then the 11 items were combined into a "Scale of Disaster Insight". The scale values ranged from 11 to 33, with a higher score indicating greater overall insight. The range of scores was divided into thirds. The general low degree of insight of the respondents is evident when one considers that 30.2 percent of the 354 respondents scored from 11 to 16, 36.4 percent from 17 to 19, and 33.3 percent from 20 to 27. Only seven individuals, or 2.0 percent of the sample, scored over 25. No one scored over 27.

The independent variables of sex, occupation, education, source of information, and disaster experience were related to the dependent variable of disaster insight by step-wise, multiple regression analysis. The results are presented in Table VIII.

TABLE VIII

Multiple Regression Analysis of Factors Related to Disaster Insight

Dependent Variable: Trichotomized Disaster Insight Scale Variable	r	b	(b) [a]	t
Sex	−0.148	−0.231	0.087	2.56**
Source of Information (1)	−0.135	−0.053	0.020	2.50**
Source of Information (2)	0.126	0.047	0.024	1.96*
Education	0.098	0.041	0.026	1.54
Occupation	0.002	0.020	0.018	1.11
Experience	−0.032	−0.060	0.105	0.56

Multiple R = 0.252
R Square = 0.063
F Ratio = 3.914**
[a] Standard error of beta
* Significant at 0.05 level
** Significant at 0.01 level

As one can observe, the results of this analysis are not very satisfactory. While the total regression equation is statistically significant at the 0.01 level, these variables together explain only 6.3 percent of the variance in disaster insight. While sex and source of information are significantly related to insight, the relationships are very weak. Males in the sample tend to be slightly more insightful than females, however, the relationship is only r = −0.148. Similar relationships are found for sources of information. Education, occupation, and disaster experience show virtually no association with disaster insight.

We can only guess at an explanation for these weak relationships. The factors that were selected logically would appear to be related to insight. In fact, the authors are not certain what additional factors should be considered. That experience is not related to insight might be surprising. However, Quarantelli and Dynes (1972) have observed that victims are no more insightful than non-victims. Often it is the victims themselves who accept and transmit

various disaster myths. Furthermore, as we noted, the type of experience held by most of these respondents is neither a recent nor salient source of information for them. Overall, however, we might propose that the weak relationships are in part a result of the lack of variation evidenced on the dependent variable. The degree of insight is homogenously low. Further research into this issue is obviously needed.

SUMMARY AND CONCLUSIONS

These findings definitely support the assumption of Quarantelli and Dynes (1972) and other writers that individuals in the public generally lack insight into disaster behavior. We have examined 11 separate dimensions of disaster response. In not a single case did the majority of these 354 randomly selected individuals exhibit insight into the predominant pattern of behavior. Apparently the myths about disaster are prevalent and widespread, at least within the area in which this sample was drawn.

It is apparent that many of these respondents have either not been exposed to or have not accepted the results of social science investigations of natural disasters. The existence of these stereotypes and the extent of their espousal point to continued practical problems for officials in communities faced with disaster. Many of these individuals expect looting to occur, panic flight to exist, and disaster shock to be present. They also may demand that their local officials take steps to limit or solve these "problems". Furthermore, for the majority of the respondents, their beliefs about aid are likely to contribute to the problems of human and material convergence.

It appears that greater attention must be paid by social scientists to disseminating their findings on disaster response to members of the public if greater insight is to be established. We have previously noted that the mass media not only is a source of many of these beliefs, but is also partly responsible for their continuance. Perhaps the role of the media could be reversed. Either through more accurate reporting of disaster events, or through documentary treatment, the media might be an important vehicle for increasing public insight. Given the high level of media consumption evidenced in this sample, it would appear to be a fruitful method for at least exposing members of the public to the myths of disaster.

It is hoped that this study not only has contributed to social science research into disaster behavior, but has also raised issues and pointed to areas deserving of further study. We now have data on the degree of insight into disaster response exhibited by a random sample of non-victim individuals residing in a non-disaster, non-subcultural locale. However, the attempt to explain differences in the amount of insight held by the respondents was not very successful. Future research should be focused on replicating this study in other areas. A possible first step might be to examine the insight of individuals in areas that often experience disaster. Furthermore, nationwide sampling might be attempted. Finally, greater attention must be given to selecting and examining those factors that are related to the degree of disaster insight.

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DIFFERENTIAL RESPONSE OF HOSPITAL PERSONNEL TO A DISASTER*

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In any major community disaster the most valuable resource a hospital possesses is its personnel. A major concern of hospital administrators therefore is the availability of personnel following the onset of an emergency. There are two dimensions to the availability of personnel as a resource for hospital organizations. Most obvious is the quantitative aspect: will there be sufficient numbers on hand to deal with the increased demands generated by the disaster? Less obvious, but possibly more important, is the qualitative aspect: will the right kinds of personnel be on hand? The "right kind" of personnel depends somewhat on the exact nature of the catastrophe and the injuries it creates (the crash of a 747 jetliner versus a tornado, for example).

In a previously published discussion of this topic Quarantelli (1970: 386) notes that, even though hospitals are staffed twenty-four hours a day, the availability of personnel is related to "the timing of the disaster in relation to the work rhythm of the organization." A disaster occurring on the weekend or late at night will find fewer and somewhat different personnel in the house than one occurring for example late in the afternoon just as one shift is preparing to go off duty while another is readying to go on duty. Personnel not present at the hospital when disaster victims begin arriving are frequently alerted to the emergency by mobilization procedures built into disaster plans, and still others report for duty voluntarily when learning of the situation. Weller and Kreps' (1975) review of disaster studies reveals that such helping behavior is facilitated by emerging norms, but they point out that this does not explain why some people (including hospital personnel) engage in helping behavior while others do not. Stallings (1970b) suggests that hospital personnel whose occupations stress the ideal of service to the community such as physicians and nurses will report for duty voluntarily to a greater extent than other types of employees.

The present paper contains a discussion of data from a survey of all hospital employees (i.e., personnel paid directly by the organization, thus excluding the medical staff) from one short-term community hospital caught up in a major disaster. The questions to which the paper are addressed include who participated in the disaster response and who did not; who was requested to report for work and who volunteered to do so; the temporal pattern in the build-up of personnel; and the kinds of information participants had as they began to respond to the incoming victims. The paper concludes with some policy and planning implications suggested by the findings. Such data should prove valuable from both the practical

*Part of the data for this study were gathered under PHS Research Grant Number 1 R01 MH15399-04 given to the Disaster Research Center of The Ohio State University. My thanks to the Center for the use of these data, but interpretation and analysis of them are my own, not the Center's.

standpoint of seeing what actually happened in one major disaster and from the standpoint of having systematic, quantitative data upon which to ground propositions for a theory of helping behavior in disaster. Before data are presented, however, some background information is provided on the disaster and on the hospital involved.

BACKGROUND

With little warning and devastating force a spring tornado ground its way through seven suburban communities surrounding a major metropolitan center in the Midwest. Hardest hit was a city of 55,000 population where 32 were killed and more than 400 others injured. Within a four-hour period the 400-bed general hospital located in this community received nearly 200 victims of this disaster. Although a tornado watch had been in effect all afternoon, first word that a tornado had actually struck came from the first victims to arrive at the hospital within two or three minutes after the storm touched down. Within fifteen minutes at least twenty-five tornado victims had been delivered, including some dead on arrival, and for the next five hours the emergency room was the scene of intense activity until the last of the injured were treated. Officially the hospital treated 187 tornado victims,[1] 58 of which were admitted and 84 others treated and released. Nine victims were dead on arrival and 37 with only minor injuries were transfered to other hospitals in the area after preliminary examination and treatment.

When it opened six years before the tornado disaster, this hospital became the second in the metropolitan area sponsored by the hospital association of a major Protestant denomination. A twenty-four member board of directors, half of whom are ordained ministers, govern the two hospitals through an executive director who himself holds a doctorate of divinity. Each of the two hospitals has a separate administrator in charge of day-to-day activities, the administrator of the hospital considered here being also an ordained minister with a Masters of Business Administration specializing in hospital administration.

Offices of the major officials of the hospital association are housed in this newer, suburban hospital. These include offices for the executive director, the controller, the purchasing agent, the public relations director, and the chaplain. Their responsibility includes both hospitals with the chaplain dividing his time daily between them. Weekly meetings of the board of directors are held in this hospital's conference room. The school of nursing operated by the association is also housed in new quarters on its grounds, and a laundry facility serves both association hospitals with daily truck service between them. As can be seen, the relationship between this hospital and its sponsoring association provide it with special facilities that might not otherwise be expected due to its size and location.

The building itself is a six-story brick structure, but at the time of the disaster construction was under way on an additional three floors. To the rear of the building and connected by a 600-foot underground hallway is a service building housing the heating plant, laundry facility, engineering department, emergency electrical equipment, and so forth. An adjoining passageway leads to the school of nursing and to the student nurses' dormitory.

The hospital has a capacity of roughly 400 beds; when the tornado struck, 375 of the 400 beds were occupied. The 58 admissions from the disaster therefore necessitated some shifting of patients already in the house, and here the value of the additional facilities of this hospital was evident. Twelve ambulatory

[1] Unofficial estimates place the total number treated at more than two hundred, the difference being a score or more tornado victims who received treatment for minor injuries but left the premises before any record of their presence was obtained. This is a common occurrence in disasters where victims not seriously injured are anxious to return to their homes or neighborhoods damaged by the storm.

patients were moved from the sixth floor medical-surgical ward to the student nurses' dormitory. Other disaster victims were housed in one wing of the maternity floor which had been cleared by moving a few maternity patients into the other ward on that floor.

From all indications, then, it is apparent that this hospital bore the brunt of the medical response to a disaster of major proportion. It is also clear that the organization was successful in dealing with the demands created by this situation with no advance notice of the enormity of the task. What was the nature of its build-up for these increased demands, especially the build-up of personnel? How was this accomplished?

DESIGN AND METHODS

Within six weeksfollowing this disaster two types of data were collected on the hospital's response to the emergency. The first were obtained through nearly forty indepth, semi-structured interviews conducted with the administrator and other officials, department heads, supervisors, physicians, nurses, and others whose position or participation in disaster activities provided them with insights into the organization's response. Much of these data have been considered elsewhere (see Stallings, 1970a) and were not utilized in this study. A second set of data were gathered through questionnaires distributed to all employees of the hospital.[2] Accompanied by a cover letter from the administrator of the hospital explaining the intent of the study and pledging the hospital's cooperation with it, a series of 23 structured and 7 open-ended questions on two legal-size pages were distributed to all personnel by the various department heads and area supervisors. Questions focused on communication patterns and on the movement of personnel over time during the five and one-half hour emergency period (from 5.25 p.m. to 11.00 p.m.). Five hundred and thirty-four usable responses were obtained, representing a response rate of slightly more than 80 percent of the hospital's paid employees at the time of the study. Eliminating questionnaires from 19 respondents who became employees of the organization only after the tornado produced an n of 515. Since no sampling, random or otherwise, was involved the data will be treated as those from a universe and only descriptive statistics utilized. Of course, findings are thus subject to certain limits of generalizability since they pertain to the experience of one hospital in one city responding to injuries created by only one kind of disaster agent. Despite this, however, a systematic evaluation of data from a reasonably complete census of organizational members has not been attempted in studies of organizations in crises, and its results, if not definitive, should at least be suggestive.

DATA AND FINDINGS

Forty-four percent (224) of the personnel responding to the questionnaire were involved in disaster activities at the hospital between the time the first victims were brought to the emergency room and the last casualties had been either admitted or released. Only 37 percent normally work during the hours encompassing the emergency period; 42 percent of those participating were from the 7.00 a.m.–3.00 p.m. duty shift, 20 percent were 8.00 a.m.–5.00 p.m. daytime employees, and 14 percent were from the 11.00 p.m.–7.00 a.m. shift. Forty-two percent (95) of the participants in the disaster response were already at the hospital when the tornado struck. Another 18 percent (40) were contacted by switch-board operators and others at the hospital and requested to report for duty, while fully 40 percent (89) of those involved reported to the hospital voluntarily after learning of the disaster.

Those at the hospital when the tornado struck heard of the disaster much sooner than

[2]The medical staff and a large women's auxiliary volunteer group were excluded for both practical and theoretical reasons.

did personnel who were elsewhere, as would be expected; fully 80 percent learned of the tornado within 20 minutes and 97 percent within one hour compared to only 37 percent of those outside the hospital who had heard the news within 20 minutes and 69 percent within one hour. However, even though they learned of the disaster earlier, those at the hospital at the time actually knew less about the magnitude of the emergency in terms of deaths and injuries than those who were not present. Three-fourths of the former had no specific information on casualties and only 12 percent could cite specific numbers of dead and injured (which for the most part proved to be inaccurate) compared to 19 percent of those not at the hospital who had heard specific casualty figures (also mostly inflated) and 57 percent with only general information (such as "many killed" and "scores injured"). One quarter of those at the hospital first learned of the tornado from the victims themselves; another 24 percent first heard the news from a fellow hospital employee; and 21 percent actually saw the storm as it passed within four blocks of the hospital. In contrast, half of those not at the hospital at the time first learned from radio and television news reports while another 13 percent witnessed the storm. In short, personnel at the hospital at the time the disaster occurred knew of the emergency much sooner but had less specific information on the number of casualties than did those who were elsewhere at the time.

A majority of those at the hospital when the tornado struck were at or near their regular duty stations. Some (ten percent) were having their evening meal in the hospital cafeteria; eight were on duty in the emergency room. Surprisingly, given the rapid speed of onset of the tornado, almost three fourths of those in the house (73 percent) knew of the storm striking before victims began arriving, although fully one fourth first heard from the victims themselves, as indicated above. Most (57 percent) immediately passed word along to coworkers either in person (69 percent) or by house phones (26 percent). None of the personnel on duty passed word of the disaster at this time to anyone outside the hospital.

Word of the tornado reached at least half of those on duty in the emergency room even before casualties were received; only four reported that their first information came from victims. Five of the eight immediately passed the word to others in the hospital that casualties were about to or had already started arriving.

More than half the nearly 200 victims handled by the hospital arrived during the first forty-five minutes after the tornado touched down, and the number tapered off gradually during the next three hours, after which time no additional casualties were delivered. However, since this disaster occurred at 5.25 on a Friday afternoon, most administrative and clerical personnel had left the building. Only the normal evening staff was on hand to deal with the first victims to arrive. Thus mobilization of a variety of off-duty personnel was necessitated. Figure 1 depicts the arrival of personnel who were not initially present at the hospital but subsequently participated in disaster-response activities. The shape of this curve is of particular interest. One of the images of hospital disaster activities pictures the build-up of personnel as a sudden process

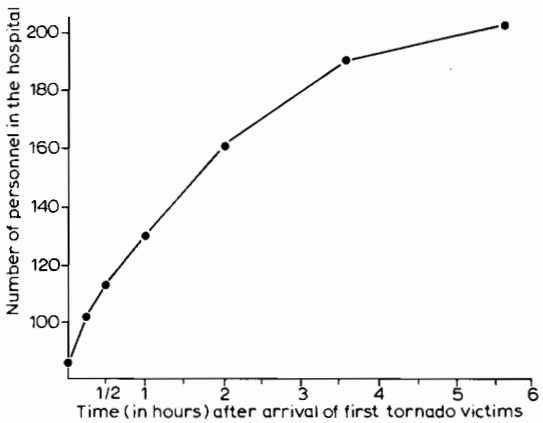

Fig. 1. The build-up of personnel in the disaster response.

with all those participating on the scene within a few minutes and few if any additional arrivals. The data clearly show, however, that this is not the case. Rather, the arrival of personnel who were a part of the hospital's response was a continuous process. A steady build-up took place throughout the entire five-and-a-half hour emergency period, although the pace tapered off slightly after about two hours. But employees were still coming in as late as 9.00 and 10.00 p.m.[3]

Of the more than 200 respondents who were involved in the organization's disaster response, 18 percent (40) had been contacted by others at the hospital, and of these 34 were requested to report for emergency duty. Slightly more than half (53 percent) of these participants were contacted within half an hour after the first arrival of victims. Forty-two percent already knew about the tornado, but a majority of those contacted (58 percent) learned of the disaster for the first time. Forty percent reported that they were notified by a person from the hospital with whom they were not normally in contact. Seventy-three percent reported that they in turn told other members of their family of the tornado; only six relayed this information to another hospital employee (in most instances by telephone). Actually, only 34 (85 percent) of those contacted by someone from the hospital were specifically asked to report for duty.[4] Of these, the bulk (79 percent) were in other communities adjacent to the stricken city while only 21 percent were inside the community itself. Apparently due to delays in reaching the hospital caused by heavy traffic and debris-clogged streets, only 9 percent of those requested to report had arrived within 20 minutes after the tornado touched down, only 21 percent within the first half hour, and still only 39 percent within the first hour. It was not until 7.30 p.m.– fully two hours after the tornado struck – that the majority (73 percent) of those employees whose services had specifically been requested were able to reach the hospital.

Those employees who came voluntarily to the hospital without having been requested to do so experienced the same sorts of hinderances. By 6.00 p.m. only 24 percent had arrived, within the first hour 35 percent, and by 7.30 p.m., two hours after the initial casualties were received, 60 percent were in the hospital. Figure 2 shows the build-up of these personnel who reported voluntarily. Their numbers increased steadily throughout the evening, tapering off only slightly after a few hours. It is important to recall that these volunteers represented 40 percent of all those hospital employees who participated in the disaster response during the emergency period. For this reason alone their involvement deserves closer examination.

Where were these voluntary participants when they learned that disaster had struck the community? Unlike employees requested to come to the hospital, half of those who came

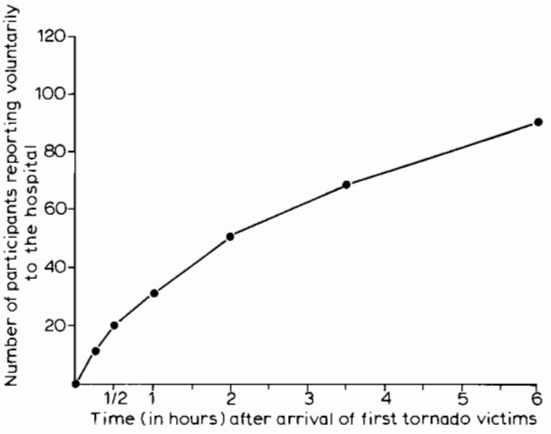

Fig. 2. The build-up of personnel who reported to the hospital on their own.

[3]This may be due in part to some members of the 11.00 p.m. to 7.00 a.m. duty shift reporting to work earlier than usual. Some 28 percent of the respondents on this shift reported to work sometime between 7.30 p.m. and 11.00 p.m.

[4]Apparently six of the forty who received calls were contacted by friends or other coworkers who merely relayed information about emergency activities. None of the six were requested to report to work. On the other hand, only 31 of the 34 who were so requested were actually able to reach the hospital.

on their own (49 percent) were inside the stricken community itself while the other 51 percent reported learning of the disaster while in one of the surrounding cities. Thirty percent of this group actually witnessed the tornado strike while another 34 percent learned of the situation from radio broadcasts. It is not surprising to find therefore that one half of those who went to the hospital of their own accord were aware of the disaster within fifteen minutes after it occurred. In terms of the content of their first information about the disaster, however, the overwhelming majority (some 91 percent) had no specific information about the number of deaths and injuries before setting out for the hospital. All they knew was that many people must have been killed and many others injured.

Who, then, were these people who reported voluntarily to the hospital? A breakdown of the volunteers by occupation is shown in Table I. Remembering that physicians were excluded from the study, it is not surprising to note that registered nurses were the largest single category of voluntary participants, comprising more than one third of the total. Nurses, after all, are the largest single category of hospital employee, and their role in an emergency such as this is clearly an important one. Next were nurses' aides followed by members of the maintenance/engineering department. However, in terms of the proportion of each category participating voluntarily, a slightly different picture emerges. First come orderlies, 75 percent of those responding to the questionnaire having gone voluntarily to the hospital, followed by engineers (55 percent) and department heads (50 percent). Overall, about a fourth (23 percent) of all personnel not at the hospital when the tornado struck reported voluntarily for duty.

TABLE I

Composition of Personnel Reporting Voluntarily to the Hospital during the Emergency Period (by occupation)

Occupation	Percent of total voluntarily participating	Percent of each category participating voluntarily*
Registered nurses	36	26
Nurses' aides	18	28
Engineers	7	55
Lab technicians	6	33
Licensed practical nurses	4	31
Department heads	3	50
Switchboard operators	3	38
Ward secretaries	3	18
Orderlies	3	75
Clerks	3	15
All others	12	–
Total	100	23

*Excluding both those who were already in the hospital and those who were requested to report for disaster duty.

A brief comparison of the backgrounds of these voluntary participants and the remaining employees who were not involved in the disaster response discloses little accounting for differences in the rate of helping behavior. Average length of employment in hospitals (including the present one) was 7 years for the volunteers, 7.5 years for the nonparticipants, and both had identical longevity records on their particular job assignments at the time of the disaster. The only difference occurred on previous hospital disaster experience. Ten percent of those reporting voluntarily had previously worked at a hospital involved in a disaster response (although the nature of their involvement was not established) compared to 6.8 percent of those not participating. Since this difference is slight, it should not be overinterpreted.

CONCLUSIONS AND IMPLICATIONS

Although the point may seem obvious, it is worth repeating that, based on this survey of nearly 80 percent of the paid employees of a hospital involved in a major disaster, less than half (42 percent) of the personnel on the payroll actually became involved in the emergency response. In other words, without total mobilization this organization treated over 200 vic-

tims of a major tornado, many seriously injured, in five-and-a-half hours. Some hospital officials in fact felt that in certain areas more personnel was present than was actually needed.

Still, the magnitude of this disaster did necessitate mobilization of certain personnel beyond those on duty, although these latter were the largest segment of participants in disaster activities. About one fifth of the participants received calls requesting that they report for duty. Nearly three times that many came to the hospital voluntarily (69 percent of those who participated but who were not initially present at the hospital). A majority of these were nursing personnel. Few of the participants possessed specific information regarding the number of casualties to expect.

These findings suggest several implications for administrative policies and disaster planning. The most general point is that of the two dimensions of personnel as an organizational resource, the quantitative and the qualitative, potential problems in the emergency phase of disaster operations would seem more likely to revolve around the latter. That is, an ample number of personnel can be expected to be on hand, but certain types of personnel may not be available, at least in the immediate post-impact period. Problems of sheer numbers could come from those whose arrival is not expected, the volunteers, but these could be averted by insuring that such volunteers as well as other incoming personnel report to a specifically designated location rather than to their regular duty station (even if this should be the emergency room). The gradual, steady build-up of off-duty personnel indicated by Figures 1 and 2 should facilitate the check-in and assignment of incoming workers. One emergency assignment station such as this is also important for alleviating some of the qualitative problems of personnel mobilization, as will be indicated below.

The qualitative aspect of personnel availability refers to the specialized skills and expertise possessed by individual members of an organization. There may be many such individuals with a certain skill or there may only be a few (perhaps only one as in the case of the hospital administrator) familiar with certain specialized tasks. And some tasks can be learned quickly by almost anyone (such as folding blankets or making sandwiches) while others require years of training and practice (surgery, for instance). The success of any organization's response to a disaster is affected not only by having sufficient numbers of personnel on hand but also by having sufficient numbers of the "right kinds" of personnel available, those who can perform tasks relevant to the nature of the situation.

Clearly the nature of the disaster agent and the type of injuries it creates affects the kinds of medical specialists required. Likewise, the time of day when a disaster occurs is related to the availability of staff in the hospital itself. Particularly in tornadoes where the speed of onset is rapid and where injuries are created with little chance for extensive preparation, qualitative problems seem most acute in the very early stages of the emergency period where the initial brunt of the response falls to those on duty.

Shortages of certain types of personnel can occur in one of two ways. A sudden influx of victims can create the need to fill out a great number of disaster tags or to transport unusually large numbers of patients at about the same time to the X-ray department or elsewhere. Here employees with greater expertise than necessary such as nurses can be reassigned to these tasks requiring fewer or easily learned skills. An altogether different problem develops when there is an initial absence of personnel with highly specialized skills, administrative or medical. Two partial solutions are possible. Some information from the site of the disaster as to the nature if not the number of injuries can allow some time for needed specialists to be alerted. Radio contact among the various hospital emergency rooms serving a given area would also make it possible to locate personnel

or resources which one hospital may not have immediately available and allow ambulances to be rerouted without undue delays. Secondly, hospital disaster simulations might include some deliberate but unannounced crossover of assignments. For example, the director of nursing services might be informed that she is the highest ranking administrative official in the house and instructed to take overall charge of disaster operations. A nursing supervisor might be instructed to make certain decisions normally handled by a physician such as those in triage. And nurses' aides might be assigned to work in medical records during the drills. Anticipation of such flexibility is probably more useful in coping with the qualitative aspects of disaster demands than building into disaster plans alternate assignments for specific individuals who may themselves be unavailable at the time of an emergency. In later stages of the emergency period when some areas are adequately staffed while others are understaffed, the same crossover of assignments can be practiced. In this particular disaster, for example, some late-arriving physicians and nurses helped prepare coffee and sandwiches for their colleagues working in the emergency room (the dietary department had finished the evening meal and closed down). In addition to the direct support such assignments provide, they also indirectly limit the number of personnel in other easily-congested areas. One problem, though not an insoluble one, is that in putting members of the "helping professions" to work on what may appear to them trivial though necessary tasks they may feel their skills are being wasted.

Whether one's interests are practical or theoretical, these findings are clearly only a beginning based as they are on the experience of one hospital caught up in a single major medical emergency. What is needed is a systematic body of knowledge based upon similar data from other organizations in other types of crises. Replication will enhance the generalizability of the present findings, sharpen the focus of these policy implications, and reduce the dependency of scholars and administrators alike on case studies and personal accounts.

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ASSESSING SOME LONG TERM CONSEQUENCES OF A NATURAL DISASTER*

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Social scientists have conducted numerous studies during the last decade into a natural disaster's impact on a community. This research (Barton, 1970; Taylor, Zurcher, and Key, 1970; and Yutzy and Haas, 1970), which has primarily studied the relatively short term effects of a disaster, debunks many commonly held myths about how victims and various elements of a community behave in the face of this type of crisis. Quarantelli and Dynes (1972), who comprehensively reviewed the relevant research and studied nearly 100 disasters, concluded that disaster victims typically behave heroically during a disaster. Contrary to the common belief that people flee in panic in the face of a disaster, Dynes and Quarantelli reported that a majority of the inhabitants do not leave the area even when sufficient warning and evacuation orders are given. Prior to Hurricane Carla (Moore, 1964), for example, half a million people left the coastal areas of Texas and Louisiana; but, despite the recognized threat and four days prior warning, the majority of residents never left their own areas. Thirty five percent of the people remained in their own homes and twenty-two percent stayed in the homes of friends and relatives within the threatened area. Dynes and Quarantelli also report that disaster victims are usually not stunned into debilitating psychological shock. Those who are physically able spontaneously organize and assist the rescue efforts, reroute congested traffic, barricade unsafe bridges, and even administer emergency first aid to injured victims. Many non-victims who live in the vicinity of the disaster rush to the scene to help in the rescue and evacuation efforts and they voluntarily house and feed displaced victims.

The extant disaster literature also provides evidence that during the emergency period the stricken communities coalesce (Barton, 1970; and Fritz, 1961). Differences in class, race, rank, and age dissolve as the people work side by side to remove the dead, locate the missing, and clear the debris. The people participate as equals in this historic event and they are soon bound together by their common fate which gives rise to a community *esprit de corps*. Even the victims, themselves, develop a high morale. They now have an unique story to tell and to retell to willing listeners; those victims who did not lose loved ones, and they usually are the vast majority, consider the grief of those who lost kin and conclude that they are fortunate; and, the victims are genuinely comforted and uplifted by the support and spontaneous outgiving from friends and even strangers. This warm support and spontaneous help reaffirms their faith in humanity and provides an ample foundation for an optimistic new beginning.

It should be mentioned, however, that not all researchers have reported observing an utopian mood in the wake of a disaster.

*Data for this study has been gathered through financial assistance provided under Contract Number 111-72-379 with the Bureau of Health Services Research and Evaluation, Department of Health, Education and Welfare.

Robert J. Lifton (1969) reported, in contrast to Janis (1951),[1] that an utopian mood did not occur after the atomic bombing of Hiroshima. According to Lifton, most survivors of the atomic bomb showed selfish behavior and a loss of moral standards despite their tradition steeped in community service and helpfulness to fellow countrymen. A technician interviewed almost twenty years later still remembered "a girl in the rain . . . she had no clothing on . . . except her panties . . . she . . . crouched on the ground and she asked me for help, putting her hands in a position of prayer. I wanted to do something for her, but she was stark naked . . . so I was at a loss . . ." (p. 50). Many survivors of Hiroshima wandered aimlessly stunned in a state of psychological shock, One victim reported, "all the people were going in that direction and so I suppose I was taken into the movement and went with them . . . I could not make any clear decision in a specific way . . . I lost myself and was carried away . . ." (p. 25).

It is unlikely that the panic, the confusion, and the psychological shock suffered by the survivors of Hiroshima is attributable to any defect in the Japanese culture. And it is also unlikely that the absence of the post-disaster heroic syndrome is attributable to the extreme destruction. The panic, confusion, and psychological shock probably occurred because the first atomic bomb blast, in contrast to a natural disaster or even conventional bombing, was totally beyond the survivors' comprehension. A physicist, for example, who was covered with falling debris and temporarily blinded recalled "my body seemed all black, everything seemed dark, dark all over. Then I thought, the world is ending . . ." A Protestant minister reported similarly feeling "that everyone is dead. The whole city is destroyed . . . all of my family must be dead – it doesn't matter if I die . . . this is the end of Hiroshima – of human kind . . . this is God's judgement on man . . ." (p. 22). In short, the entire atomic bomb experience left the survivors groping unsuccessfully for words with which they could comprehend the unnatural order. This inability to comprehend their fate and to understand their plight probably accounted for the survivors' general inability to cope and their atypical unheroic behavior.

The extant disaster research which pertains to the victims' behavior in the face of disaster and for the first few days following the catastrophe can probably be properly summarized by saying that the victims behave in accordance with the best of human tradition when they comprehend what happened to them and can reasonably predict their fate. However, whether or not this heroic syndrome and general optimism sustains these victims further down the road is another, largely unanswered question.

Drabek, Key, Erickson, and Crowe (1973) conducted one of the few studies of a disaster's long term impact on individuals. They fortuitously used systematic interviews obtained prior to the Topeka tornado as a basis for assessing family functioning three years after the disaster. The most salient finding of the Drabek et al. study was that three years after the disaster the victims still maintained an utopian mood. They reported fewer symptoms of emotional disorders, they were just as physically healthy as the non-victim controls; and, they frequently reminisced about the help and the offers to help that they had received. The majority of this help and the most significant help came from close friends and relatives with whom the victims, in contrast to the controls, increased their affiliation. Concurrently the victims, in comparison to the controls, tended to extricate themselves from civic organizations and activities. Drabek et al. concluded that the

[1] Reviewers of an earlier version of this paper raised questions about the validity of the observations by Lifton (1969) compared with that reported by Janis (1951); they also questioned treating wartime situations in the same category as civilian catastrophes. Lifton did interview survivors and his account is not purely speculative. While a wartime bombing obviously differs in many respects from a natural disaster, both are certainly major crisis events for the participants and along some lines are analytically comparable.

victims' informal helping networks were essential in fostering and maintaining their durable, extremely therapeutic utopian mood.

The study presented in this paper further researched the long term impact of a natural disaster. In this case the disaster was a rain-induced flash flood that swept through Rapid City, a community in southwestern South Dakota, in the late evening and early morning of June 9 and 10, 1972. Rapid City, with a population of approximately 42,000 people who live nestled against a range of low mountains, was in the direct path of the flood. The disaster did in excess of 100 million dollars in property damage and killed 237 people. By any standards this flood was one of the country's major natural disasters.

METHODOLOGY

All obtainable data that is routinely collected by the city, county, state, or various businesses and might reflect either economic or social post-flood changes was gathered. This data consisted of police arrest records, school attendance, unemployment figures, number of divorces, county health statistics and other quantified information that was systematically maintained as a normal business or government procedure. Such routinely collected data is not, of course, particularly sensitive to a victim's post-disaster psychological state; but, this technique of assessing a disaster's impact did offer three advantages: (1) Routinely collected public records have not previously been extensively used to assess a disaster's impact; (2) The data is inherently more objective and thereby more reliable than a victim's subjective opinions and, (3) The technique respects the victims' right to privacy and does not impose on these people for the sake of rather sterile and cold scientific inquiry.

This study examined post-disaster economic and social changes for the community, as a whole, and for some randomly selected victim families. These victim families were selected from the 550 such families temporarily housed after the disaster in mobile homes placed on public trailer sites by the Department of Housing and Urban Development (HUD), an agency of the federal government. Fifty families were initially sampled but 15 of these families were dropped from the study because, quite consistent with the community's normal 40% rate of transience per year, they had left town. Of the 35 remaining families, 24 were White, 10 were Indian, and one family was Negro.

FINDINGS

The disaster's most detectable impact was on the city budget which jumped from five million dollars allotted for 1972 to 32 million for 1973. The bulk of this budget increase was flood-related federal dollars that poured into the city to facilitate the post-disaster recovery. During this time the amount of money on deposit at the local banks climbed from a monthly mean of 93 million for the 12 months prior to the flood to a mean of 121 million for the 13 months after the disaster. The dollar value of building permits issued in Rapid City concurrently increased from a monthly mean of $733,700 for the year prior to the flood to a mean of $1,950,700 for the next thirteen months. All of these variables are, of course, related to the reconstruction of the flood damaged buildings.

The disaster also had a decided impact on the employment market. The average available work force for the three summer months of 1971 was 25,200 people, but this available work force increased to an average of 27,233 workers for the three months after the flood. However, in these first months after the flood sufficient jobs were not available and the jobless ranks swelled by roughly 1500 people as unemployment shot from 3.9% to 10.4%. The available work force swelled again during the summer of 1973 to a monthly average of 27,417 people; but, during this summer, a full

year after the flood, most of these potential workers found jobs and the unemployment rate stabilized at a monthly average of 3.2%.

The disaster's impact on the cost of living was also examined. Comparisons from the American Chamber of Commerce Research Agency of the cost of living index for Rapid City and Sioux Falls, South Dakota, did not reveal any significant price increases in Rapid City for food, utilities, or housing. The finding that the cost of rental housing did not increase after the flood was so inconsistent with local hearsay that the want ads in the local paper were examined for a comparison of pre- and post-disaster rent prices. The want ads did not substantiate the common belief that there was a significant post-disaster increase in rent prices.

A host of variables were examined to detect community-wide social and personal changes that occurred after the flood. There was no significant increase in the reported number of attempted or actual suicides or single car accidents, which is a variable that could be interpreted as a suicidal gesture. Nor was there any significant increase in juvenile deliquency arrests, citations for driving while intoxicated, automobile accidents, infant deaths, scarlet fever, strep throat, hepatitus, or prescriptions for tranquilizers.

Changes among several variables did indicate, however, that some significant social and personal alterations occurred after the flood. In the 17 months after the disaster the number of divorces and annulments increased by 125 as compared to the previous comparable months and jumped from a former record of 34 in a month to 47 in one month. This increase in the number of divorces and annulments per month was statistically significant ($t = 3.14$, $df = 16$, $p < 0.005$). In the nine months after the flood the number of non-terminated conceptions also increased. The number of conceptions in July of 1972 was 14 fewer than in July 1971, but the number of conceptions increased by an average of 10.6 per month for the next eight months, which was a statistically significant change ($t = 2.14$, $df = 7$, $p < 0.025$). Concurrent with these social alterations was a statistically significant increase in arrests for public intoxication. In the ten months following the disaster the average number of arrests for public intoxication increased from 230 to 286 per month ($t = 2.12$, $df = 9$, $p < 0.05$). There was also an increase in the number of families receiving Aid to Dependent Children (ADC) from the State Welfare Department. The average number of families receiving ADC for the four quarters prior to the flood was 855. In the four comparable quarters after the disaster the number of families receiving ADC was consistently higher and the mean increase was 41 families.

The disaster's impact on the 35 randomly sampled victim families was also examined from both the economic and social perspectives. These families had four sources of financial assistance after the flood. The Rapid City Disaster Foundation, a quickly formed non-profit corporation that distributed donated money, gave $1,430,000 to victim families and businesses. However, the board of directors voted to destroy its records when the organization dissolved a year after the flood which made it impossible to identify the victims that actually received money. The Small Business Administration (SBA), a federal agency, loaned money to adult flood victims at 1% interest. This money was intended for replacing personal property and the first $2500 of the loan was forgiven. The victims could also turn to the Church Disaster Response, a coalition of local churches who pooled their donated money to help flood victims. In addition to these directly flood related sources of financial help, Urban Renewal bought extensive property in the flood-plain to establish a green belt and also paid money to any person who had to relocate as a result of Urban Renewal's purchase of rented living quarters.

Of the 35 sampled families, 80% received an SBA loan, 71% were contacted by Urban

Renewal who determined that 15 families were eligible for money, and 43% obtained money from Church Disaster Response. Of the ten Indian families, nine collected $32,000 from the Small Business Administration, nine received $13,332 from Urban Renewal, and eight families collected $4,674 from Church Disaster Response. The ten Indian families received a total of $50,406 for an average of $5,040 per family, which exceeded their reported average yearly income by almost $1,500. Eighteen of the 24 White families received $169,600 from SBA. 15 families collected $40,022 from Urban Renewal, and seven families drew $874 from Church Disaster Response. One family did not receive any money from any of these sources. The 23 families that received money obtained a total of $210,496 for an average of $9,152 which was nearly equal to their reported average income for 1971.

Following the disaster the victims housed in HUD public trailer parks were not more frequently involved in activities that were a liability to the community's welfare, e.g. these victims were not more frequently arrested for public intoxication, driving while intoxicated, moving vehicle violations, or any other offense; they did not make more visits to the community mental health center or the state welfare office; and, they were not more frequently delinquent on their personal property taxes.

These families did, however, manifest some personal symptoms of stress. They made significantly more visits in search of jobs to the local State Employment Security Office in the 12 months after the flood than they had in the same months prior to the disaster ($t = 2.36$, $df = 36$, $p < 0.025$), and their children were more frequently absent from school during the year following the flood ($t = 2.05$, $df = 21$, $p < 0.025$). There was also a strong but not statistically significant trend among the members of the Indian families to spend more days in the Public Health Hospital during the year after the flood as compared to the previous year ($t = 1.31$, $df = 26$, $p < 0.11$) and to make more visits to that facility's outpatient clinic ($t = 1.36$, $df = 26$, $p < 0.10$).

DISCUSSION

Rapid City, as a community, did not experience a major mental health crisis after the flood. There was no rash of attempted suicides, no line of distressed victims at the door of the mental health center, and there was not even an increase in prescriptions for tranquilizers. In fact, if the articles in the local paper about the guardmen's superhuman response, the heroic acts of particular victims, and the city's miraculous recovery are indicators, then the community, in general, experienced the typical post-disaster utopian mood.

Yet, some marked changes did occur in the disaster's aftermath. There was an increase in arrests for public intoxication, divorces and annulments, non-terminated conceptions, and requests for Aid to Dependent Children. All of these variables can be interpreted as indices of social stress; but, there are several reasons to believe that this stress was experienced by only a small segment of the community and to conclude that the stress was not directly precipitated by the disaster.

The social stress that occurred after the flood was probably felt primarily among a segment of the lower socio-economic categories. It is, after all, the lower socio-economic categories who are generally arrested for public intoxication and it is the lower socio-economic categories who request ADC. Both public intoxication and requests for ADC increased after the flood while the number of prescriptions for tranquilizers, which is a variable that presumably would reflect stress among the middle and upper-middle categories, did not increase. Even the increase in non-terminated conceptions can, according to an official in the South Dakota State Division of Vital Statistics, be attributed to a disproportionately high number of births among minority group women. The only variable among this set of markedly changed social

indicators that does not clearly affix this stress to the lower socio-economic categories is the increase in divorces and annulments.

Not only did this social stress occur primarily among a segment of the lower socio-economic categories but the stress was likely induced by and possibly restricted to the deluge of transient, relatively rootlesss people who, according to the Job Placement Supervisor of the local South Dakota Employment Security Office, inundated the community in the months following the flood. These people came to Rapid City with less than adequate financial resources and without any assurances of finding jobs in the recovery work. Most of these transients did not find immediate work and the unemployment rate shot upward. Moreover, each of these indices of social stress, i.e. public intoxication arrests, indices of social stress, i.e. public intoxication arrests, divorces and annulments, non-terminated conceptions, and requests for ADC, rose with the unemployment rate. By the summer of 1973 the job market finally absorbed this swelled work force and each of these indices of stress concurrently abated. Clearly, the most plausible conclusion is that these changes were precipitated by this influx of lower socio-economic, transient people who could not find steady employment.

Examination of the routinely collected data for the 35 randomly selected HUD trailer park families revealed that these families generally received substantial financial help from most of the available sources; yet, they suffered some stress in the months following the flood. This stress was not unburdened on the community via more arrests, delinquent personal property taxes, increased visits to the community mental health center, or more demands on the welfare caseworkers. The stress was generally absorbed more personally through heightened unemployment, increased school absenteeism, and more days in the hospital and more visits to the outpatient clinic by the Indian members of the sample.

The stress induced by living in these HUD post-disaster trailer parks was not, however, unique to Rapid City. Essentially the same debilitating effects of HUD trailer parks were observed in Buffalo Creek, West Virginia (Harshbarger, 1973; and Morris, 1974) and in Wilksbarre, Pennsylvania (Feld, 1973; and McGee, 1973) following disasters in those communities. These indices of stress among the families housed in HUD public trailer parks is in such sharp contrast with the almost invariably reported post-disaster utopian mood that the HUD trailer parks, themselves, are suspect as a source of stress. The very composition of the HUD trailer parks, therefore, warrants examination.

After the Rapid City flood HUD temporarily housed 1270 families in either private rental housing, mobile homes located on private lots, or mobile homes parked on public trailer sites. The more affluent families generally found private rental housing or placed a HUD mobile home on a private lot. The less affluent flood victims tended to be placed on a first-come, first-served basis in HUD trailers on public sites. This procedure placed White, Indian, and Negro families together into almost instantly created and totally unplanned racially integrated neighborhoods. These neighborhoods generally became permeated with such racial tension that the Rapid City Chief of Police instituted systematic patrols of these trailer parks. This racial tension almost certainly played a large role in precipitating the stress among the disaster victims who were housed in the HUD public trailer parks.

This study initially sought to assess the disaster's impact; but, it found that the federal disaster relief program, itself, has a considerable long term impact on the stricken community and the disaster victims. The federal disaster relief program provides considerable help through emergency clearance of debris, temporary housing, and low interest loans; but, according to the findings of this study, the program has some negative effects. These negative aspects are not, however, inherent in the

federal relief program and they probably can be avoided. Specifically, the stress among a segment of the lower socio-economic categories probably occurred because excessively large numbers of transient people came to Rapid City with the expectation of finding jobs in the widely publicized federally financed recovery work. Thus, this stress could have been avoided by news releases that played down the massive federal financial aid and emphasized the relatively high rate of unemployment. Similarly, the stress precipitated by the HUD trailer parks probably could have been mitigated by proper attention to the disaster victims' psychological needs. These victims desire to talk about their grief; they want solace for their losses; and, they need to plan for the future. In short, the disaster victims need the therapeutic strengths of their natural helping networks, which other research (Drabek et al., 1973) has shown to be essential in facilitating a positive post-disaster recovery. However, the HUD temporary housing program destroys the victims' natural helping networks and it more or less isolates the people in racially tense trailer parks. Thus, this stress probably could be ameliorated if the HUD temporary housing program would relocate neighborhoods rather than individual families and would institute a low visibility program that simply put isolated individuals in contact with an effectively functioning helping network.

Beyond detecting several sources of post-disaster stress and suggesting ways to mitigate this stress, this study also provides evidence that routinely collected data such as police arrests, births, marriages, etc. is a reasonably effective technique for studying the impact of a disaster on a stricken community and on selected disaster victims. Moreover, this technique can be used by researchers to assess the impact of other disasters that have occurred within the last decade and it can provide a basis for comparing the impact of these various natural disasters.

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THE HARWELL CHEMICAL EMERGENCY CENTRE

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INTRODUCTION

Emergency situations involving chemical substances can result from a wide variety of causes, with perhaps road transportation accidents and warehouse fires being the most frequent. The United Kingdom Atomic Energy Authority has been concerned for more than 25 years (Bromley, 1974; Hamilton, 1974a and 1974b) with the safe handling and disposal of hazardous wastes, which includes all kinds of toxic, flammable and potentially explosive substances. It was therefore logical that in the years before national arrangements were made in the U.K. for dealing with chemical incidents, Harwell was consulted by the public emergency authorities (police, fire services) and others for advice and assistance. Chemical companies, especially those with established emergency teams were also contacted in a similar way.

The movement and storage of hazardous chemical products has increased considerably in recent years throughout most of the world. Problems in the identification of hazards associated with chemical names and trade name mixtures have added to the difficulties facing the public emergency authorities when called to incidents involving such materials.

Considerable advances have been made to minimise hazards, particularly in the transport field (Feates and Cumberland, 1974) by introducing improved labelling schemes and more demanding legislation. It is to the credit of the chemical industry and associated transportation organisations that few serious incidents involving chemicals occur. Nevertheless it was widely felt that the time had been reached for formalising existing emergency arrangements into a unified national scheme for dealing with such incidents. At the same time additional encouragement should be given to improve still further the general standards of safety in carrying hazardous loads, with emphasis on driver training, throughout the chemical industry.

In 1972, the Chemical Industries Association (C.I.A.), which represents most of the chemical producers in the U.K., set up a working party in consultation with Central Government to study this problem. This resulted in the formation of the Chemical Industry Scheme for Assistance in Freight Emergencies 'CHEMSAFE' (C.I.A., 1973) in January 1974. The Chemical Emergency Service provided by Harwell became formally established by the Department of the Environment as a National Chemical Emergency Centre and integrated into the Chemsafe scheme, providing a 24-hour service, in addition to its original activities.

The role of the Chemical Emergency Centre can be conveniently divided into two principal

areas:

1. A National Advice Centre in collaboration with Chemsafe:

(a) providing advice to the emergency services on a round-the-clock basis, when such advice cannot be obtained directly from the manufacturer or trader.

(b) provision of assistance at chemical incidents within a 50 mile radius of Harwell. Outside this area the Centre will alert teams from other locations nearer to the scene.

2. An emergency disposal service to industry and others in possession of chemicals which have become potentially explosive or otherwise hazardous by prolonged storage, e.g. peroxides in solvents, polymerisable materials, badly corroded gas cylinders. Each of these activities will now be considered in more detail.

NATIONAL ADVICE CENTRE

The need for identifying the hazards associated with trade name chemical products has always been one of concern for the emergency services. Sometimes containers labelled only with 'Brand X' leak, perhaps as a result of a transportation accident. Immediately on arriving at the scene, the emergency authorities normally need to know if the material is hazardous, what precautions they should take in handling it and if it can be safely flushed into drains or ditches.

A national scheme has recently been introduced in the U.K. to provide this 'first aid' information by means of a simple code (Hazchem) displayed at the rear of a vehicle. At the moment its use is being confined to bulk loads of hazardous chemicals conveyed in road and rail tank vehicles but will eventually be extended to cover individual items in mixed loads. It will of course, in any event, be essential to follow up such first aid measures with more detailed advice, normally from the manufacturer.

Rarely can such information, particularly on trade name products, be found in standard reference books. These may indicate the manufacturer's name but this is of little value if he cannot be contacted, which may be the case outside normal working hours, and especially so with imported chemicals. This was the dilemma facing the emergency services prior to Chemsafe. Now they can contact the Chemical Emergency Centre at Harwell using an ex-directory telephone line, the number of which has been given only to the emergency services.

This telephone is manned continuously and a team of technically qualified staff is always available. During normal hours an emergency duty officer is available at the Centre. Outside these hours he is obliged to remain 'on call' to receive any calls referred to him by the Emergency Centre and be prepared to immediately attend if required.

The Centre holds information on chemical substances, particularly trade name products, which has been obtained direct from the manufacturers, traders or importers by the Chemical Industries Association, using specially designed questionnaires (see Appendix I). This information is stored in the Harwell Chemical Data Bank (Cumberland and Hebden, 1975) on an IBM 370 computer. The computer program employed, 'Status' (Price et al., 1974), enables the data bank to be searched on a free text principle to identify any substances matching a description provided by an enquirer. This description could be a trade name, colour of the substance or its container or even part of a name existing perhaps on a torn or corroded label. Clearly, the more precise the description provided by an enquirer, the fewer the number of substances match that description, until ideally only one is retrieved – the correct one. This would provide the information being sought.

Information retrieved by the computer is read on a Visual Display Unit (VDU) located in the Chemical Emergency Centre (see Fig. 1). The system used is capable of being extended

to allow direct 'dial in' facilities from remote stations such as Police or Fire Control rooms or even individual fire appliances using Post Office telephone lines and existing radio links. Information can either be displayed on a VDU or linked to a teletype for permanent copy. The data held could also be extended to suit the requirement of other users. Parts of the data bank are already being augmented in this way under a contract from the E.E.C. as part of the Environmental Chemicals Data Information Network (ECDIN), which will provide more extensive data on chemicals of environmental importance.

In the event of information sought not being held in the computer bank, duty emergency officers have immediate access to a substantial reference library adjacent to the control desk. This contains numerous reference books on chemical hazards including foreign trade directories.

The range of incidents in which the Harwell Centre has been called includes:

Bags of white 'crystals' bearing a trade name only, washed ashore on the Scilly Isles which were causing concern about possible pollution of the beaches. The material was rapidly identified as high density polythene granules, non-toxic and harmless. Such an incident illustrates the need for holding information on trade name products whether they have toxic properties or not.

On another occasion the Centre was asked to identify the hazards of a chemical substance contained in a blue polythene drum found on the roadside. The container had obviously fallen from a vehicle and only a small section of a purple label remained bearing the words 'speed' and 'etch'. This information together with a description of its container enabled not only its contents to be identified as 'ferric chloride solution' but also its manufacturer who was duly invited to collect his product!

Not all situations of course, involve chemical spillages. A fire in a warehouse containing large stocks of pesticides in polythene containers created a serious situation. The Emergency Centre was able to identify the hazards associated with the trade name products involved and advise the fire crews of the neces-

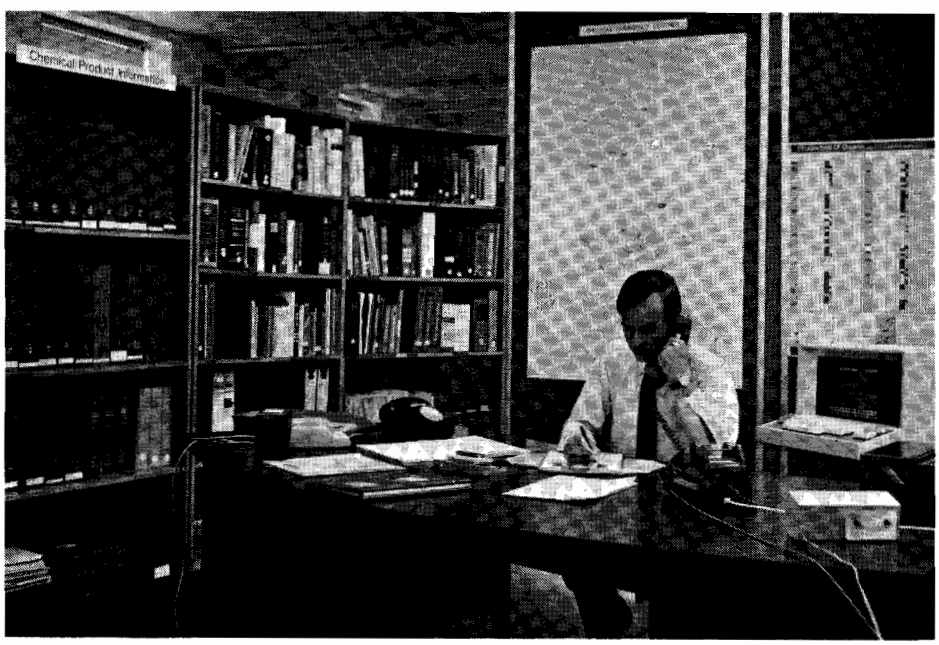

Fig. 1. Chemical Emergency Centre

sary precautions whilst the fire was being contained. On this occasion it was also proved necessary for the Centre to make available heavy duty PVC suits to supplement the fire brigade's own protective clothing, which was being adversely affected by the highly concentrated pesticide solutions. This illustrates the way the Emergency Centre at Harwell is also able to provide practical assistance at incidents in addition to technical advice; as part of the Chemsafe Scheme it holds specialised equipment. This aspect of the Centre's activities is now discussed in more detail.

ASSISTANCE AT CHEMICAL INCIDENTS

The Harwell Chemical Emergency Centre has a Land Rover vehicle equipped to provide assistance at local chemical incidents (up to about 50 miles away). In other areas, similar emergency services, operated by the chemical industry, can be contacted by Harwell to provide assistance when required. A mobile laboratory is also maintained in a permanent state of readiness for use at chemical incidents where more detailed chemical analysis is necessary.

The CEC vehicle (see Fig. 2) is fitted with a hydraulic winch for the recovery of heavy containers and a 4 kW generator providing power to operate a variety of electric tools and lighting equipment. It also carries breathing apparatus, personal VHF radios, additional protective clothing to supplement the duty officers' personal kit, and a VHF radio for communication. A range of non-sparking implements (hand tools and shovels) are included for use in potentially flammable areas and portable monitoring equipment such as an explosiometer and gas detectors.

The mobile laboratory can be towed by the vehicle and is intended for use at incidents where laboratory facilities are required, possibly in remote locations for an extended period. The laboratory is a self-contained unit which has, in addition to sophisticated analytical equipment, VHF radio, shower and cooking facilities and the capacity to accommodate one or two people. These facilities make the unit sufficiently flexible to be

Fig. 2. C.E.C. Vehicle

employed in a wide variety of situations and for it to serve as a control centre if required.

All of the duty officers at the Emergency Centre are trained to use the specialised equipment in the mobile laboratory whenever it is needed. One frequently occurring incident is the recovery of chemical drums fallen from lorries and subsequently found on the roadside. Whenever possible the manufacturer or distributor of such materials is identified and invited to collect his wares from the Emergency Centre. Costs are recovered from the company concerned.

Other situations requiring attendance have ranged from dealing with leaking chemical road tankers to clearing a spill of mixed chemicals following the collapse of shelves in a school laboratory. The latter incident involved flammable, corrosive and toxic liquids; personnel from the Chemical Emergency Centre, wearing self contained breathing apparatus throughout the operation, took several hours to clear it up.

An unusual incident occurred when 30 or so firemen called to extinguish a fire on a refuse landfill site, were overcome by fumes and taken to hospital. It was thought that this may have been due to toxic materials deposited on the site. Concern was being expressed whether a nearby village, down wind, should be evacuated. A call was made to the Emergency Centre in the late evening and within 30 minutes two duty officers were on their way. After carrying out an inspection of the site no evidence of toxic materials could be found though the burning refuse was decidedly unpleasant. The firemen concerned recovered shortly afterwards and it was considered that they were merely affected by the dense smoke.

EMERGENCY DISPOSAL OPERATIONS

The disposal of chemical products which have become unstable and potentially explosive through age has often created difficulties. Prolonged storage of ether can give rise to peroxide formation and monomers such as acrolein, liable to spontaneous polymerisation; this is a typical danger of such products.

The Chemical Emergency Centre has provided advice and assistance to a wide range of organisations which have these disposal problems, including industry, government departments, teaching establishments and hospitals. Considerable experience has been gained in this field which is now nationally recognised. For some disposals, specialised equipment such as remote handling apparatus must be developed – an area in which the U.K. Atomic Energy Authority has considerable expertise. Other situations exist where a material may be highly toxic as well as unstable and necessitate additional handling precautions. Such a situation is illustrated in the following example.

A substantial quantity of an explosive chemical, thought by its owner, a dealer in Government surplus materials, to be harmless, was discovered in a warehouse located beneath a major road. This material, believed to have been manufactured about 25 years previously, originally contained about 30% water and was packed in rubber bags inside wooden crates. With the passage of time, the rubber had perished and the chemical had become dry, making it shock-sensitive. In addition it presented a high toxic risk. Many of the crates needed to be repacked before they could be safely moved to a nearby disposal site for safe burning. Its movement became a major operation involving a bomb disposal unit, the police, fire and ambulance services and other Government departments. Fig. 3 shows some of the crates being repacked by the Chemical Emergency Centre staff who advised on the toxic aspects of the operation.

In another case, a small quantity of acrolein about 4 years old was reported to have exploded in a refrigerator causing substantial damage (B.C.I. Safety Council, 1973). The explosion was attributed to the acrolein's spontaneous polymerisation caused by the hydroquinone inhibitor becoming ineffective through age.

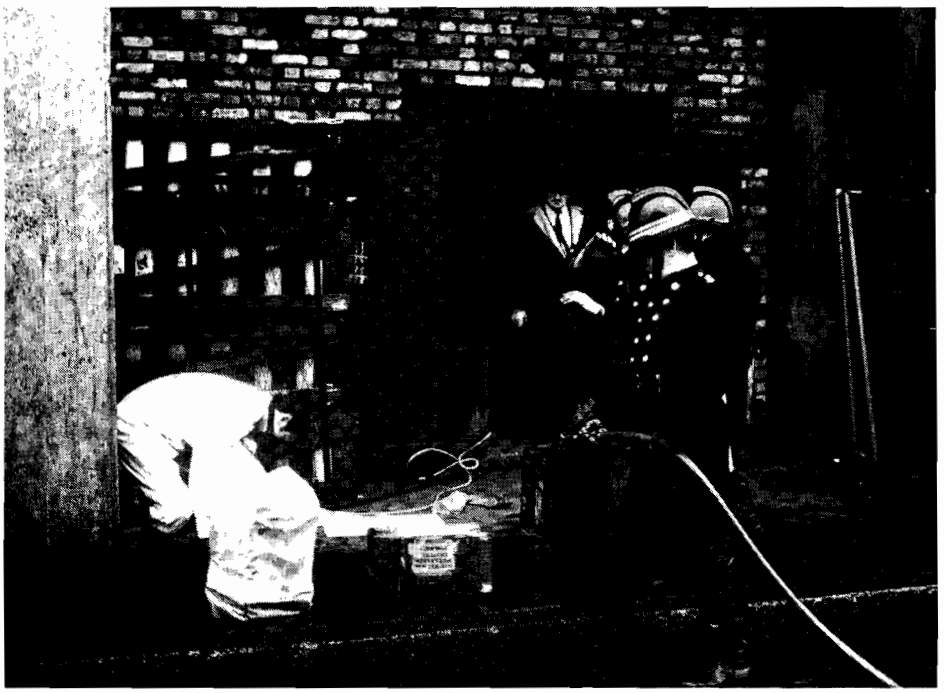

Fig. 3. Repacking hazardous material on location

Acrolein is also highly toxic and flammable. The suppliers of this material subsequently warned users of the inherent dangers of prolonged storage. Within a short period many drums of aged material were traced in various parts of the United Kingdom. In one case a large quantity had lain undisturbed for 14 years and was remotely moved from its location by lifting through the roof of its storage building. It was subsequently conveyed to a nearby safe area in a specially designed steel container (see Fig. 4), then opened by means of an explosive charge and the acrolein allowed to burn away harmlessly.

Picric acid is another material with which the Centre has been concerned. In one case six reagent bottles were discovered in a laboratory store and found to be in a dry condition and therefore potentially explosive. Some of the bottles had been standing close to a steam pipe and were thought to be more than 30 years old. The laboratory staff concerned were unaware of its hazardous nature. The material is normally kept in a wet state when it is relatively harmless. This picric acid was disposed of by the Chemical Emergency Centre by remote handling and was conveyed under police and fire service escort to a disused quarry and electrically detonated. The crater, produced by two 100 g. bottles, was more than 12″ deep.

Gas cylinders which have become corroded through age and neglect, have in the past created disposal problems to companies and local authorities. In most cases such cylinders are unsuitable for re-use and can present extreme hazards for anyone attempting to open them. A national need for such a disposal service was recognised and consequently the Chemical Emergency Centre, in collaboration with an army bomb disposal unit, extended its activities into this field.

Cylinders which are safe to transport, and which would have been in doubtful cases radiographed, are conveyed to an army firing range and opened explosively. Many of the

Fig. 4. Emergency disposal of Acrolein

Fig. 5. Safe destruction of industrial gas cylinders

cylinders safely destroyed in this way have flammable contents and Fig. 5 illustrates the effect of detonation.

CONCLUSION

The Chemical Emergency Centre at Harwell fulfills a national role covering all aspects of chemical emergency situations. It is probably unique in providing a sophisticated national advice service combined with the ability to give practical assistance when required. This has been made possible by the extensive back-up facilities and expertise available throughout the United Kingdom Atomic Energy Authority and the excellent relations which have been maintained with the chemical industry and emergency services.

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APPENDIX I

CHEMICAL INDUSTRIES ASSOCIATION LIMITED
CHEMSAFE – CHEMICAL PRODUCT EMERGENCY INFORMATION

1. NAME OF COMPANY . . . . . .

   ADDRESS . . . . . .

   . . . . . .

	Manuf'd.	Marketed	Imported
2. PRODUCT NAME (i.e. NAME GIVEN ON LABEL/PACKAGE)			
ALTERNATIVE NAMES USED			
(IF ANY)			

Please √ box

3. CODE MARKS (if any)

4. APPROVED CHEMICAL NAME OF CONSTITUENTS (with approx. concn. if mixture)	%

5. PHYSICAL FORM

SOLID	
LIQUID	
GAS	

Please √ box

COLOUR:
OTHER FEATURES:

6. TYPE OF PACKAGING

	size and description
SACK	
DRUM	
BULK	
OTHER	

7. HAZARDS (Brief description and handling precautions)

Flash Point (if flammable)

8. PRODUCT/HAZARD CLASSIFICATIONS (if known)

U.N. SERIAL NO.
U.N. HAZARD CLASSIFICATION (Division & Subdivision)
KEMLER CODE
HAZCHEM CODE

9. RECOMMENDED EMERGENCY ACTION IN EVENT OF:

a) SPILLAGE

b) FIRE (eg. extinguishing media)

10. FIRST AID TREATMENT

11. NAME OF INDIVIDUAL/ORGANISATION WITH SPECIALIST KNOWLEDGE

. . . . . .

EMERGENCY TELEPHONE NUMBER

AVAILABILITY (days and hours)

12. PRINCIPAL TRANSPORT ROUTES:

13. LITERATURE REFERENCES (eg. Technical data sheets giving additional information)*

14. NAME AND TELEPHONE NUMBER OF COMPILER (in event of any queries)

. . . . . .

*Wherever possible such publications should be included with this completed form.

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THE IMPACT OF DISASTER ON PRIMARY GROUP LINKAGES*

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American society, like other "post-industrial societies" (Bell, 1973), reflects a long-term trend of increased bureaucratization. Most of our day-to-day activities occur within social settings which reflect many of the principles Weber (1947) identified before the turn of the century. It matters not whether one is an Indian baby born in Oklahoma, a Black seventh grader in a Washington, D.C. public school, a middle-aged Chicano manufacturing shoes in Los Angeles, or an elderly Polish woman in Trenton mailing a letter while on the way to mass – the reality of bureaucracy is pervasive.

Not all of our time is spent in such settings, however. There are the quiet moments – times when the gods of technical expertise and of efficiency are put aside. Far less visible than the varied types of monuments built through bureaucracies, nearly all individuals participate daily in a wide variety of primary groups (Cooley, 1909; Litwak and Szelenyi, 1969), wherein the rules of the game often contradict the guiding principles which make bureaucracies possible. Undoubtedly, the most significant type of primary group for most Americans is the nuclear family. In direct contrast to the long-term trend of bureaucratization – wherein skilled managers have increased the differentiation, size, and power of their organizational weapons – American living patterns have shifted over the last two hundred years with the nuclear family emerging as a predominant organizational pattern (e.g., Winch, 1963; 1970). When contrasted to many other societies, the differences in interaction patterns and expressions of reciprocity among kin are dramatic (Parsons, 1943; Gouldner, 1960), both on a daily basis (Stephens, 1963), and in times of crisis (Kates et al., 1973).

But this is not to say that nuclear families within America are isolated totally (Sussman, 1959; Mindel, 1970). Like any other social unit, nuclear families exist within a complex physical and social environment. The boundaries are not closed; rather, families are penetrated from every direction. However, paralleling analyses of complex organizations (Haas and Drabek, 1973) and other types of social units, much research on families has reflected

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a "closed system" imagery wherein environmental fluctuations and linkages have remained relatively ignored (Aldous, 1970; Ruano, et al., 1969; Leichter, 1967). Relationships with kin are perhaps the most obvious linkage between nuclear family members and units within their environment. While the sixties produced numerous investigations of kin interaction (we recently located over two dozen published studies which were conducted between 1960 and 1972; see Drabek et al., 1975); it was not until 1972 that the first empirical study was published wherein a national sample of Americans was used (Klatzky, 1972). This was a pioneering effort, but many questions remain unanswered, e.g., only married male respondents were used and data were limited to relationships with male relatives (Klatzky, 1972:5).

What are the theoretical implications of these observations? There are several. But most importantly, the need for more thorough and systematic analyses of nuclear family environments is underscored. Alternative linkages to environmental sectors and consequences of shifts and variations in these require empirical exploration. In short, the insights offered by such "open system" theorists as Buckley (1967) and Bertalanffy (1968) should serve as guides for a wide variety of empirical studies.

Let's try an analogy to emphasize one of the many insights offered by this perspective. Picture an octopus. From the pulsating head extend eight tentacles. Each is reaching outward, seeking to establish a link to some aspect of its environment. Should another one be nearby, their tentacles might touch and form a bond. Knowledge about the environment and rapid adaptations to changes in it are facilitated through these tentacles.

We found that this imagery – the family as an open system, an octopus if you will – was exceedingly helpful in trying to understand the human side of a highly destructive tornado which ripped through Topeka, Kansas, June 8, 1966. Radiating out from each victim family were a set of "tentacles" in a sense – links to other social units, be they kin, neighbors, or friends. Of course, unlike the octopus, families vary greatly, both from one another and over time, regarding the number and strength of such tentacles. While we do not want to minimize the violence or destruction of this tornado, or any other type of natural disaster, we do believe that our understanding of the human consequences of such events has been hindered in the past because we have focused excessively on the degree and extensiveness of physical losses. Thus, while many Topeka families did incur many types of losses because of this tornado, most of these same families almost simultaneously experienced a rapid influx of inquiries about their well being. Often these inquiries were coupled with offers of help and assistance. Indeed, for victim families these emergent sets of transactions were as much a part of the event as were the losses in property and physical injury (see Crowe, et al., 1973).

While the emergence of such "therapeutic communities," as Fritz (1961; 1957) labeled this phenomenon, has been documented widely (e.g., Dynes, 1970; Fritz and Mathewson, 1957; Quarantelli, 1960), we still lack much understanding of the degree of variation among families regarding the intensity and consequences of their involvements. We do have an exceptional, albeit speculative model from Barton (1969:216–279) comprised of numerous hypotheses which specify variations in the speed of emergence and extensiveness of these "altruistic communities". But we have not located a single study wherein the *long-term* consequences of such involvements have been examined (Mileti et al., 1975).

Following the 1966 tornado, the Topeka community rapidly responded in accordance with the predictions that researchers like Fritz (1961), Barton (1969), or Quarantelli and Dynes (1972) might offer. Taylor, Zurcher and Key (1970) have prepared a detailed account of the rise and gradual demise of an

emergent "therapeutic community" as individuals within various types of primary groups and bureaucratic structures throughout Topeka and its environs sought to help the sixteen hundred who were left homeless and the thousands of others who incurred less severe losses. In turn, most of the 338 victims interviewed during the course of our study reported that they received aid from some source, e.g., 54 percent received assistance from relatives, 42 percent from friends. As might be anticipated, receipt of such assistance co-varied with several social characteristics of the families, as we have reported elsewhere (Erickson, et al., 1974). Nearly all of the aid received was offered to these families – rarely did they ask. When they did, their requests were directed toward bureaucratic structures, e.g., Red Cross, Salvation Army, rather than primary groups comprised of relatives or friends who were by far the more frequent sources of help.

But what of the *long-term* impact of such experiences? What consequences, if any, would we expect such events to have on linkages with primary groups several years later? Would neighbors become closer? Would friendship groups become more intense? Following a brief description of our methodological strategy, we will report findings related to these questions.

METHODOLOGY

Prior to the 1966 tornado, Key, Taylor and Zurcher had completed two interview surveys with over thirteen hundred lower income Topeka families (Key, 1967; Taylor, et al., 1966). Through newspaper accounts, Red Cross records, and information secured from other organizational officials, staff at the Menninger Foundation had identified several victim families among those who had been interviewed previously. We saw this data base as affording a unique opportunity to construct a quasi-experimental design (Campbell and Stanley, 1966: 47–50) wherein victim and non-victim families might be compared both before and a few years after the tornado. However, upon initiating this "follow-up" project, we decided to expand the design by obtaining four additional samples for which only post-disaster data would be available but which would include victim and control families in both high income and low income sectors of the city. This provided a larger data base and increased variation in socioeconomic status which was desired since the initial surveys were conducted in areas destined for urban renewal and anti-poverty programs. Figure 1 depicts our final design through which victim and comparison families were selected for interviewing. These averaged about two hours and were conducted by many of the same interviewers who had participated in the earlier pre-tornado studies.

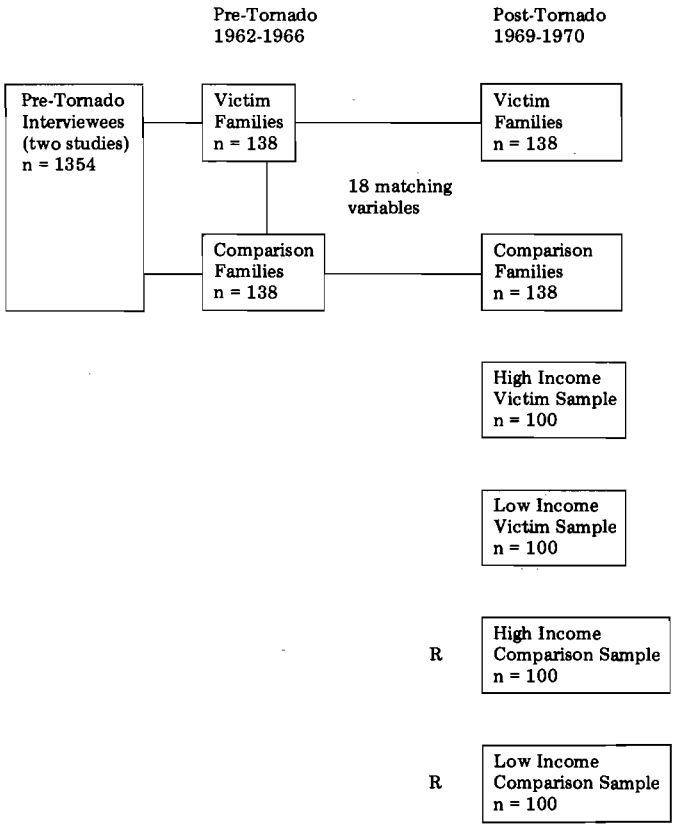

Fig. 1. The research design. (R designates random selection.)

A highly detailed account of the major problems we confronted and the procedures implemented is available elsewhere (Drabek et al., 1973). Here we will confine ourselves to two major points. First, a few comments regarding "internal validity," i.e., are there differences between the victim and comparison families other than the tornado experience which might account for any variations found regarding primary group linkages? In an effort to maximize equivalence among the victim and non-victim family samples we did two things. First, as victim families were identified, eighteen matching variables were used to select the "best fit" from among the pool of over a thousand families for whom comparable pre-data were available, e.g., ethnicity, age and sex of respondent, kin interaction, total family income, and the like.[1] This was true, of course, only for the 138 victim families for whom such data were available; the two hundred comparison families (high and low income) with only post-disaster data were selected randomly in accordance with the number of victim families located in each respective census tract.[2] The precision matching was accomplished using a procedure devised by Yinger, et al. (1967). Upon constructing an "index of congruence" whereby the degree of difference between each matched pair was obtained, we found that we had attained "closer" matches than they reported in their initial use of this procedure.

But what of other events which might have occurred in the three years following the tornado? Of course, no two families have identical social histories. However, in an effort to assess whether or not the samples might differ widely, we formulated fourteen questions concerning various types of family crises including the tornado, e.g., "In the past three years, has any family member had a serious injury or a major operation?" "Any who had passed away?" "Any serving in the Armed Forces?" Only two of the contrasts were significant statistically ($P < 0.05$). A slightly higher percentage of comparison families had a member in the Armed Forces during the three-year period (11%-V; 18%-C) and also indicated the death of a close friend or relative during this time (56%-V; 67%-C). While far from assuring that the victim and comparison samples were equivalent, these data, like the analysis of the degree of fit obtained through the precision matching procedure, indicated that these families differed primarily in one way – for only some the Wednesday evening of June 8, 1966 had special significance. Within the limits of this design then, we have some basis for attributing differences found between victim and comparison families to the tornado experience. However, the possibility remains that any differences reported may reflect some other source of variation not yet identified.

In contrast to these types of issues concerning the degree of group equivalence is another set of questions pertaining to "external validity" (Campbell and Stanley, 1966), wherein we ask – "How far beyond the families studied can we generalize our findings?" There are two dimensions to this issue: (1) generalization to other families; (2) generalization to other events. In our judgment, these are the most serious design deficiencies in this study. While self-selection was not problematic, we had no way of knowing the total number of "victims" within the community or the degree to which our samples may have been representative of this universe. Actually, the determination of "who is" and "who is not" a victim within a community disaster of this type turns out to be rather complicated. In addition, analyses regarding the degree to which our matched samples corresponded to the "pool" of pre-tornado interviewees from which they were selected have indicated that the sample of families in our study differed on several variables (see Erickson et al., 1973, for detailed presentation).

A second type of generalization represents an equally important constraint. This study was based on a single case – the 1966 Topeka

tornado. Until research is completed on several other events with *comparable analytic criteria*, any generalization must be viewed as speculative (Drabek, 1970; 1969). For example, these Topeka families experienced what appeared to be a rather intense post-disaster "therapeutic community" following the destruction and injury of this tornado. How might the long-term consequences on primary group linkages differ if a similarly destructive event occurred which was not complemented by this community response? Similarly, tornadoes strike rather randomly and with minimal warning in contrast to most floods or hurricanes. Few pre-disaster adjustments are possible. Finally, while seventeen persons were killed, given the enormity of the property damage which was estimated at over one hundred million dollars (Taylor, Zurcher and Key, 1970: viii), few families lost members. To generalize any of our findings to events with *different analytic characteristics* would surely be in error.

In short, a recent survey of the published literature did not yield a single study focused on the long-range consequences of disaster on primary group relationships (Mileti et al., 1975). Given the design deficiencies in previously published disaster research, we concluded that our methodological rigor represented a major step forward. However, our study did have several limitations, most notably restrictions on the range of generalization. These should be kept in mind as we review the findings.

FINDINGS

What are the consequences on the linkages between nuclear family units and other primary groups three years after being victimized by a large scale natural disaster? This is one of several questions dealing with different aspects of family functioning that we have sought to penetrate through our analysis of the Topeka data. Linkages of four different types of "quasi-primary" groups will be discussed: (1) relatives, (2) friends, (3) neighbors, and (4) voluntary associations of various types.[3]

Linkages with Relatives

As indicated above, many families (54%) received aid of various forms from relatives shortly after the tornado. But now, three years later, would victim and non-victim families reveal different patterns in their relationships with relatives? Data related to three aspects of kin relationships are summarized in Table I. While only one of the comparisons was significant statistically, there was a *slight* tendency for victim families to interact more frequently with their immediate kin, despite the fact that they appeared to be somewhat less involved in a kin network and reported less frequent exchange transactions with kin such as borrowing or lending. As we have reported elsewhere (Drabek et al., 1975), this same trend was found when only the matched samples were compared. Furthermore, the pre and post comparisons indicated that these differences were not due to matching inadequacies. That is, between the two time periods, victim families shifted in their responses to form this pattern, whereas non-victims were more stable.

Generally speaking, these same patterns were found when victim and comparison families were reviewed within both the high and low income samples (see Table II). In five out of the six comparisons, there was a slight tendency for victims to interact more frequently with their immediate kin than non-victims. Reflecting variations in life styles, families in the lower income sample reported far more frequent kin interaction than those in the upper income sample. Results related to participation in a kin network and exchange transactions were less consistent and there was one notable exception to the lower rates among victims – low income victim families reported a higher frequency of participation in activities with relatives than non-victims. Also, the dif-

TABLE I

Linkages with Relatives among Victim and Comparison Families*

Criterion Group	*Interaction Frequency with Immediate Kin*								
	Parents			Married Children			Siblings		
	Yearly	Monthly	Weekly	Yearly	Monthly	Weekly	Yearly	Monthly	Weekly
Victim Families	30 (37)	19 (23)	50 (61)	28 (36)	9 (11)	63 (80)	52 (124)	18 (43)	30 (71)
Comparison Families	38 (49)	22 (29)	40 (52)	29 (39)	11 (14)	60 (80)	56 (129)	18 (40)	26 (57)
V-C X^2		2.76			0.34			1.43	

Criterion Group	*Frequency of Participation in a Kin Network*					
	Frequency Relatives Get Together			Frequency of Activities with Relatives		
	Once a year or less	Several times per year	Monthly or more	Never	Less than monthly	Monthly or more
Victim Families	55 (145)	33 (87)	12 (33)	18 (48)	43 (116)	39 (105)
Comparison Families	51 (138)	38 (102)	11 (29)	20 (55)	40 (108)	40 (108)
V-C X^2		1.59			0.80	

Criterion Group	*Frequency of Exchange Transactions with Kin*					
	Borrow or Lend			Do Favors		
	Rarely	Yearly	Monthly	Rarely	Yearly	Monthly
Victim Families	68 (183)	16 (43)	16 (43)	41 (108)	18 (47)	42 (111)
Control Families	61 (166)	19 (52)	20 (54)	31 (82)	22 (58)	48 (129)
V-C X^2		2.91			6.04**	

*Figures listed are percentages; corresponding N's are included in parentheses.
**$P < 0.05$.

ferences between the high and low income samples were rather inconsistent here as well, with more higher income families indicating frequent participation in activities with relatives generally.

Despite some inconsistencies and several instances where the groups being compared were highly similar, four trends were clear. First, victims evidenced a slightly greater frequency of interaction with their immediate kin than did non-victims. Second, non-victim families reported more frequent rates of participation in a kin network and exchange transactions with unspecified groups of relatives.

TABLE II

Linkages with Relatives among Victim and Comparison Families: High Income and Low Income Samples*

Criterion Group	*Interaction Frequency with Immediate Kin*								
	Parents			Married Children			Siblings		
High Income Sample	Yearly	Monthly	Weekly	Yearly	Monthly	Weekly	Yearly	Monthly	Weekly
Victim Families	31 (15)	31 (15)	38 (18)	49 (16)	9 (3)	42 (14)	49 (40)	26 (21)	26 (21)
Comparison Families	37 (23)	27 (17)	37 (23)	33 (13)	18 (7)	49 (19)	57 (49)	17 (15)	26 (22)
V-C X^2		0.40			2.18			1.84	
Low Income Sample									
Victim Families	28 (11)	10 (4)	63 (25)	23 (13)	5 (3)	71 (40)	54 (46)	13 (11)	33 (28)
Comparison Families	32 (12)	16 (6)	53 (20)	35 (18)	4 (2)	62 (32)	63 (50)	18 (14)	20 (16)
V-C X^2		1.59			1.75			3.65	
High vs. Low X^2		9.94**			9.40**			2.23	

Criterion Group	*Participation in a Kin Network*						*Exchange Transactions with Kin*					
	F. Relatives Get Together			F. of Activities with Relatives			Borrow or Lend			Do Favors		
High Income Sample	OY	STY	M	N	LTM	M	R	Y	M	R	Y	M
Victim Families	52 (50)	37 (35)	12 (11)	16 (15)	45 (44)	39 (38)	64 (62)	21 (20)	16 (15)	34 (33)	22 (21)	44 (43)
Comparison Families	47 (47)	41 (41)	12 (12)	8 (8)	49 (49)	43 (43)	54 (54)	20 (20)	26 (26)	21 (20)	25 (24)	55 (53)
V-C X^2		0.53			2.66			3.46			4.43	
Low Income Sample												
Victim Families	55 (54)	36 (35)	9 (9)	13 (13)	47 (46)	40 (40)	64 (63)	16 (16)	20 (20)	41 (40)	18 (18)	41 (40)
Comparison Families	56 (54)	35 (34)	9 (9)	34 (34)	33 (33)	33 (33)	64 (64)	21 (21)	15 (15)	32 (32)	24 (24)	44 (44)
V-C X^2		0.01			12.19**			1.39			1.92	
High vs. Low X^2		1.54			23.92**			1.08			3.75	

*Figures listed are percentages; corresponding N's are included in parentheses. See Table I for code categories, e.g., OY = once a year or less.

**$P < 0.01$

Third, families in the high income sample interacted less frequently with immediate kin than did those in the low income sample, although they did report more frequent contacts and exchanges with relatives generally. Finally, aside from one instance, the pattern of victims reporting more frequent interaction with immediate kin, but less participation in activities and exchanges with relatives generally, held in both the high and low income samples as well as the matched samples.

Linkages with Friends

In contrast to relatives, 40 percent of the families interviewed indicated that they interacted regularly with a group of friends (see Babchuck, 1965). As reflected in the data presented in Table III, the percentage of victim families reporting a linkage of this type was slightly higher than the non-victims. And the frequency with which such interaction took place was slightly higher for victims as well.

To try and ascertain the relative strength of these linkages to friends, all interviewees were asked who they visited with more – friends or relatives? Who they would turn to if confronted with a "money problem" or a "family problem"? A larger proportion of victim families chose relatives over friends in each instance. While victims only slightly more frequently reported linkages to groups of friends, a much larger number indicated stronger bonds to relatives. Also, lower percentages of victims designated

TABLE III

Linkages with Friends among Victim and Comparison Families*

Criterion Group	*Participation in Friendship Groups*				
	Gets Together with Group of Friends		Frequency Friendship Group Gets Together		
	Yes	No	Yearly	Monthly	Weekly
Victim Families	42 (141)	58 (195)	19 (27)	41 (58)	41 (58)
Comparison Families	39 (133)	61 (204)	18 (24)	49 (65)	34 (45)
V-C X^2	0.44			1.93	

Criterion Group	*Strength of Linkages – Relatives vs. Friends*							
	Visit More Frequently		Who to Contact with Future F P			Who to Contact with Future M P		
	Relatives	Friends	Relatives	Friends	Institution	Relatives	Friends	Institution
Victim Families	52 (134)	48 (122)	65 (149)	31 (71)	5 (11)	50 (130)	8 (20)	42 (110)
Comparison Families	39 (102)	61 (161)	56 (136)	33 (79)	11 (27)	40 (104)	7 (18)	53 (139)
V-C X^2	9.62***			7.51**			6.37**	

*Figures listed are percentages; corresponding N's are included in parentheses. "Institution" in lower portion of table refers to such responses as "bank," "minister," "doctor," i.e., where neither friend nor relative was viewed as most likely potential help source.

**$P < 0.05$.

***$P < 0.01$.

TABLE IV

Linkages with Friends among Victim and Comparison Families: High Income and Low Income Samples*

Criterion Group	*Participation in Friendship Groups*				
	Gets Together with Group of Friends		Frequency Friendship Group Gets Together		
High Income Sample	Yes	No	Yearly	Monthly	Weekly
Victim Families	62 (62)	38 (38)	21 (13)	45 (28)	34 (21)
Comparison Families	52 (52)	48 (48)	10 (5)	58 (30)	33 (17)
V-C X^2	2.04			3.19	
Low Income Sample					
Victim Families	34 (33)	66 (65)	17 (6)	43 (15)	40 (14)
Comparison Families	25 (25)	75 (74)	39 (10)	42 (11)	19 (5)
V-C X^2	1.68			4.65**	
High vs. Low X^2	30.70****			2.85	

Criterion Group	*Strength of Linkages – Relatives vs. Friends*							
	Visit More Frequently		Who to Contact with Future FP			Who to Contact with Future M P		
High Income Sample	Relatives	Friends	Relatives	Friends	Institution	Relatives	Friends	Institution
Victim Families	33 (30)	67 (61)	55 (49)	37 (33)	8 (7)	48 (46)	5 (5)	47 (45)
Comparison Families	25 (24)	75 (73)	52 (49)	31 (29)	17 (16)	38 (37)	3 (3)	59 (57)
V-C X^2	1.77			3.65			1.56	
Low Income Sample								
Victim Families	68 (64)	32 (30)	63 (56)	21 (19)	16 (14)	47 (46)	5 (5)	47 (46)
Comparison Families	43 (42)	57 (56)	55 (47)	35 (30)	9 (8)	39 (37)	6 (6)	55 (33)
V-C X^2	12.35****			4.80**			2.88	
High vs. Low X^2	27.33****			2.87			0.52	

*Figures listed are percentages; corresponding N's are included in parentheses. "Institution" in lower portion of table refers to such responses as "bank," "minister," "doctor," i.e., where neither friend nor relative was viewed as most likely potential help source.

**P < 0.10.

***P < 0.05.

****P < 0.01.

some type of institution, such as a bank or minister, as a future help source. In short, while the trend was not always dramatic, more victim families appeared to have stronger linkages to friends, but their linkages to relatives were even tighter.

An identical pattern appeared within both the high income and low income samples (see Table IV), aside from a slightly lower frequency of interaction with friends among the victim families in the high income sample. But within these samples, the victim to non-victim contrast was much more pronounced. Fewer families in the low income sample reported linkages to friendship groups, in contrast to the high income, and their bonds to relatives were more intense. We were somewhat surprised, however, to find that both samples were nearly identical regarding the sources they would turn to if they had a money problem.

Regardless of their socioeconomic status then, a slightly larger proportion of families victimized by this tornado appeared to have tighter linkages to groups of friends. But their bonds to relatives were even stronger, especially as perceived as sources to whom they could turn in the event of some future emergency. Perhaps this pattern reflects a residual effect of their participation in the "therapeutic community" which emerged immediately after the tornado.

Linkages with Neighbors

A much clearer pattern was present in data related to linkages with neighbors (additional empirical studies of neighboring include Key, 1965; Litwak, 1961; Fellin and Litwak, 1963; Nohara, 1968). Consistently, fewer victim families reported bonds with neighbors than did those in the comparison sample. Among those who did visit with neighbors, victims did so somewhat less frequently. Over one-third (35%) of the victim families indicated that they had no neighbors with whom they interacted regularly, in contrast to 27 percent of the non-victims. Similarly, across five separate items specifying different types of help that they might have given to or received from neighbors, larger proportions of victims indicated non-involvement. Finally, fewer victim families evidenced positive feeling towards their neighbors and fewer indicated that there were neighbors with whom they would try to maintain contact if they moved. In accordance with Homans' (1958) hypothesis, lower interaction rates between victim families and their neighbors, co-varied with less positive sentiments toward them as well.

In a remarkably consistent manner, these same trends appeared within the high income sample (see Table VI). Across the three general indicators and each of the ten items of which they were comprised, victim families within the high income sample evidenced less intense bonds with their neighbors. The picture within the low income sample was mixed, however. While substantially fewer victim families reported that they visited with their two nearest neighbors, those that did indicated slightly more frequent visiting. Low income victims indicated about the same number of neighbors with whom they spent time regularly as their non-victim counterparts. Similarly, the victim–non-victim differences regarding participation in the neighbor help pattern were very slight and inconsistent in direction. However, in accordance with the general trend found in the combined samples, low income victim families did express slightly less positive sentiments towards their neighbors.

Neighbors, as a type of external linkage, clearly were more important in the lives of families in the high income sample than those in the low income. A much larger proportion of the high income families reported that they visited with neighbors regularly. Similarly, they visited with a larger number of neighbors, although the frequency of such visits was slightly less. Aside from helping with housework, larger proportions of high income families indicated that they had shared such tasks

TABLE V

Linkages with Neighbors among Victim and Comparison Families*

Criterion Group	*Visitation Pattern with Neighbors*							
	Visits with Two Nearest Neighbors		Frequency of Visits			Number of Neighbors with whom Some Time is Spent Regularly		
	Yes	No	Monthly	Weekly	Twice Weekly	None	Very Few	Many
Victim Families	60 (199)	40 (133)	28 (58)	24 (49)	48 (98)	35 (94)	47 (126)	19 (51)
Comparison Families	78 (260)	22 (75)	25 (64)	29 (76)	46 (121)	27 (74)	49 (133)	24 (65)
V-C X^2	24.27****			1.84			4.26	

Criterion Group	*Neighbor Help Pattern – Number of Families Indicating they Participated in these Activities*				
	Housework	Pick up at Store	Borrow & Lend Groceries	Caring for Children	Helping when N. F. has illness
Victim Families	15 (38)	34 (85)	34 (83)	29 (66)	48 (120)
Comparison Families	18 (44)	40 (99)	44 (108)	38 (90)	58 (142)
V-C X^2	0.65	2.08	6.03***	3.98**	4.54***

Criterion Group	*Sentiments Toward Neighbors*					
	Feelings Toward Neighbors			Neighbors would Maintain with, if Respondent Family Moved		
	Positive	Neutral	Negative	None	One	Several
Victim Families	66 (179)	23 (63)	10 (28)	32 (86)	23 (62)	45 (123)
Comparison Families	74 (201)	20 (55)	6 (16)	22 (61)	26 (72)	51 (140)
V-C X^2		5.08**			6.09***	

*Figures listed are percentages; corresponding N's are included in parentheses.
**P < 0.10.
***P < 0.05.
****P < 0.01.

with neighbors as picking up groceries at the store or caring for children. And given this pattern of interaction and exchange, the more positive sentiments expressed towards neighbors by families in the high income sample followed consistently.

But while linkages to neighbors were more intense for families in the high income sample, victims within this sample consistently reported less interaction, fewer exchanges and less positive sentiments when compared to non-victims. While the low income sample evidenced less

TABLE VI

Linkages with Neighbors among Victim and Comparison Families: High Income and Low Income Samples*

Criterion Group	*Visitation Pattern with Neighbors*							
	Visits with Two Nearest Neighbors		Frequency of Visits			Number of Neighbors with whom Some Time is Spent Regularly		
High Income Sample	Yes	No	Monthly	Weekly	Twice Weekly	None	Very Few	Many
Victim Families	72 (70)	28 (27)	33 (24)	29 (21)	38 (28)	30 (30)	48 (47)	22 (22)
Comparison Families	90 (89)	10 (10)	23 (20)	24 (21)	53 (47)	14 (14)	51 (51)	35 (35)
V-C X^2	10.06***			3.81			8.94**	
Low Income Sample								
Victim Families	49 (48)	52 (51)	18 (9)	22 (11)	59 (29)	38 (38)	43 (43)	18 (18)
Comparison Families	71 (71)	29 (29)	21 (15)	35 (25)	44 (32)	39 (39)	46 (46)	15 (15)
V-C X^2	10.49***			2.82			0.38	
High vs. Low X^2	21.54***			2.16			15.83***	

Criterion Group	*Neighbor Help Pattern – Number Assisting in these Activities*					*Sentiments Toward Neighbors*					
						Feelings Toward N.			N. would Maintain Contact		
High Income Sample	Housework	Store	Gro.	Child.	Illness	Pos.	Neu.	Neg.	None	One	Several
Victim Families	11 (10)	37 (33)	43 (39)	34 (26)	49 (44)	80 (80)	16 (16)	4 (4)	25 (24)	22 (22)	53 (52)
Comparison Families	23 (21)	48 (44)	65 (59)	53 (48)	71 (65)	85 (85)	11 (11)	4 (4)	17 (17)	24 (24)	59 (59)
V-C X^2	4.57**	2.53	8.43***	6.10**	9.60***		1.08			1.70	
Low Income Sample											
Victim Families	21 (19)	33 (30)	31 (28)	28 (24)	50 (45)	58 (57)	29 (28)	13 (13)	32 (32)	28 (28)	40 (40)
Comparison Families	18 (15)	38 (32)	38 (32)	29 (24)	48 (40)	66 (66)	29 (29)	5 (5)	26 (26)	29 (29)	45 (45)
V-C X^2	0.30	0.43	0.94	0.08	0.10		4.21			0.93	
High vs. Low X^2	0.29	1.78	13.89***	10.09***	4.63**		20.68***			7.53***	

*Figures listed are percentages; corresponding N's are included in parentheses. See previous table for more complete listing of stub labels.

**$P < 0.05$.

***$P < 0.01$.

consistent results, the total data set clearly indicated that victims evidenced less intense linkages to neighbors than did non-victims.

Linkages with Voluntary Associations

Beyond the neighborhood, about one-third of the Topeka families interviewed indicated that they participated in a wide variety of voluntary associations (for comparison see Dotson, 1951; Booth, 1972; Williams, et al., 1973). While not a primary group in the strict sense of the term, these associations, political and special interest groups did represent important linkages which were often highly personalized. Victims were slightly less likely to belong to such groups, but in general, both in membership proportions and type of group, they did not differ much from the comparison families. However, a larger percentage of victims did indicate affiliation with a religious organization (74% vs. 67%), and among the affiliates, victims reported a higher frequency of attendance.

Generally, these same trends appeared within both the high and low income samples. However, church affiliation was no more characteristic of high income victim families than their non-victim counterpart. There was a dramatic difference in church attendance among victims (82%) and non-victims (50%) within the low income sample, however. Perhaps this reflected a greater therapeutic quality of the church for low income families. Pre- and post-tornado data on the matched samples supported this interpretation in that over time victim families increased their frequency of church attendance while comparison families attended less regularly.

TABLE VII

Linkages with Voluntary Associations among Victim and Comparison Families*

Criterion Group	*Belong to Social or Civic Groups*		*Type of Social or Civic Groups*				
	Yes	No	Lodges-Frat. e.g., Moose	Veterans-Political	Hobby-Interest e.g., Sport. Cl.	Inst. e.g., YMCA	Other
Victim Families	32 (108)	68 (230)	38 (41)	13 (14)	23 (25)	14 (16)	10 (11)
Comparison Families	37 (125)	63 (212)	31 (39)	13 (17)	36 (45)	16 (20)	3 (4)
V-C X^2	1.97				4.85		

Criterion Group	*Participation in a Religious Organization*				
	Church Affiliation		Frequency of Church Attendance		
	Yes	No	Yearly	Monthly	Weekly
Victim Families	74 (176)	26 (61)	18 (50)	18 (49)	64 (177)
Comparison Families	67 (155)	33 (77)	28 (72)	19 (49)	53 (137)
V-C X^2	3.13**		8.47***		

*Figures listed are percentages; corresponding N's are included in parentheses.
**$P < 0.10$.
***$P < 0.05$.

TABLE VIII

Linkages with Voluntary Associations Among Victim and Comparison Families: High and Low Income Samples*

Criterion Group	*Belong to Social or Civic Group*		*Type of Social or Civic Groups*				
High Income Sample	Yes	No	Lodges-Frat. e.g., Moose	Veterans-Political	Hobby-Interest e.g., Sport. Cl.	Inst. e.g., YMCA	Other
Victim Families	54(54)	46(46)	37(20)	7(4)	32(17)	11(6)	11(6)
Comparison Families	55(55)	45(45)	34(19)	7(4)	40(22)	16(9)	1(1)
V-C X^2	0.02			4.80			
Low Income Sample							
Victim Families	30(30)	70(70)	40(12)	16(5)	16(5)	23(7)	3(1)
Comparison Families	38(38)	62(62)	26(10)	23(9)	31(12)	18(7)	0(0)
V-C X^2	1.43			4.33			
High vs. Low X^2	17.04***			11.03**			

Criterion Group	*Participation in a Religious Organization*				
High Income Sample	Church Affiliation		Frequency of Church Attendance		
	Yes	No	Yearly	Monthly	Weekly
Victim Families	78(50)	22(14)	21(18)	17(15)	62(53)
Control Families	78(50)	22(14)	31(27)	19(17)	50(44)
V-C X^2	0.00			2.74	
Low Income Sample					
Victim Families	82(56)	18(12)	15(13)	24(21)	61(52)
Control Families	50(32)	50(32)	22(14)	16(10)	62(39)
V-C X^2	15.53***			2.30	
High vs. Low X^2	4.26**			2.79	

*Figures listed are percentages; corresponding N's are included in parentheses.
**$P < 0.05$.
***$P < 0.01$.

As would be anticipated, linkages to voluntary associations were more prominent among those in the high income sample (55% high; 34% low). And there were marked differences in the type of associations in which families in these differing socioeconomic levels participated. Higher income families more frequently participated in hobby or special interest groups, while larger proportions of the low income families indicated involvement in veteran or political groups and various institutional groups like the "Y" or scouting.

Given this array of data and the limitations of our research procedures, what conclusions can we draw? Did the experience of being victimized by this tornado appear to have any type of lasting consequence on the types of primary group linkages that these families had?

CONCLUSIONS

Did the 1966 Topeka tornado affect the linkages of these nuclear families with other primary groups? Recall our analogy of the

octopus – one wherein we proposed that most family units could be conceptualized as having a series of "tentacles" radiating outward to link the family system to a wide variety of other social units. What consequences would being a disaster victim have on these external linking mechanisms?

Before pursuing this question, however, two cautionary remarks are in order. First, our data concern a single event; any who generalize our findings beyond, especially to events with markedly different analytic characteristics, should recognize that they may be led astray. Second, despite the quality of our design – which was more rigorous than any we have encountered in the published literature to date on human responses to natural disasters – there were other limitations regarding both internal and external validity. We really don't know if any of the group differences observed actually were by-products of the tornado experience or simply reflections of pre-existing differences between the samples of which we remained unaware. Similarly, the degree to which our results might correspond to those found in another American community remains problematic. Thus, while this investigation was a significant step forward, results that might be applicable in a variety of other settings await further research.

We identified four types of external groups with whom nuclear families might be linked. In each instance *trends* were identified in our data which indicated differences between victim and non-victim families. Linkages with relatives and friends appeared to have been strengthened *slightly*, in contrast to a rather sharp and more consistent weakening of bonds with neighbors. Victims were slightly less attracted to voluntary associations now, with one notable exception – religious institutions. The difference here among families within the low income sample was most dramatic. Certainly these data would justify speculation that for low income families the salience of the church was increased for those who suffered losses through this event. In general, however, while there were some inconsistencies, these differences between victims and non-victims held regardless of socioeconomic status and have been further substantiated through the pre- and post-tornado comparisons which have been made thus far.

Returning to our analogy of the octopus, each family had a set of tentacles which linked them to other social units. These linkages were the social routes through which much economic and psychological support were channeled during the hours and days of putting things back together (Gouldner, 1960). Those which reached out to kin and friends – the very tentacles which were strongest prior to the tornado – now appeared to be even more extensive, three years later. In contrast, those extending to neighbors and various types of voluntary associations were less intense. These appeared to have been weakened – except for one particular type of link – those joining families to some type of religious organization. Perhaps these patterns are residual consequences of feelings of reciprocity generated through participation in the post-disaster therapeutic community (Gouldner, 1960).

For the most part then, families who were victimized by this disaster generally resembled those with similar social characteristics, but who did not have the misfortune of residing within the path of this destructive funnel cloud. Three years afterwards only memories remained. The city was rebuilt and life continues as before. Yet, while not dramatic and at times somewhat inconsistent, several trends appeared in our data which suggested that certain residual effects had remained. Social bonds through which recovery was facilitated now appeared to have been strengthened at the expense of other linkages which had become somewhat less central in the everyday lives of these Topeka families. Tentacles which were strong initially were now even stronger; weaker ones were weakened even further.

NOTES

1 The eighteen variables used for matching were as follows (the first five listed were designated as "top priority": ethnicity, age and sex of respondent; family type (a ten category typology which specified household composition, e.g., children, and woman alone or man alone; children and man, wife, relative living together; no children and man and woman living together, unmarried or married; and so on); kin interaction (an 8 interval Guttman scale designed to measure the degree of participation with kin through such items as: "How often do you see your parents?"); welfare support; religious affiliation and frequency of church attendance; total family income, occupation and formal education of household head; neighborhood interaction (a 7 interval Guttman scale based on such items as: "Do you and any of the other women help one another? For instance, helping with meals or housework, picking up things at the store, caring for children, and so on); total number of persons in household; whether family owned or rented their home; length of time the family had lived in their present home; age of oldest child; help source available in Topeka that had been used in the past for financial or personal problems; intra-family strain (based on degree of marital conflict and rating of marital happiness); and participation in voluntary organizations."

2 The eight census tracts within the tornado path that had the lowest and highest ratings on median family income and property values were selected. This process must be used with caution since not all who reside in a so-called low income census tract would have low incomes, as Robinson (1950) and Barton (1969: 214–216) have stressed in their critiques, i.e., "the ecological fallacy". Based on data collected from respondents in each type of census tract, however, income and educational differences were substantial. For example, 60 percent of the low income sample had completed eleven years of schooling or less, whereas this was true of only 15 percent of the high income group. Similarly, 53 percent of the high income sample, as opposed to 10 percent of the low income, had attended college.

3 In general we will ignore pre- and post-tornado contrasts except where it appeared that these findings would alter our interpretations of the victim–non-victim contrasts. A thorough presentation of these data and those pertaining to a large number of related research questions will be available in a monograph currently in preparation.

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PLANNING FOR EMERGENCY OPERATIONS*

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A common characteristic of all events and situations designated as emergencies is that they call for unusual efforts by individuals and/or unusual commitments of resources by organizations and communities, often with little advance warning. Accordingly, when we treat a breakdown or a mechanical failure, an injury or a major disaster, a disruptive event or massive civil disorder, or any other potentially damaging circumstance as an "emergency", we do so, not because of the special and spectacular nature of the event, but rather because we anticipate or observe effects of a scope and intensity that lie beyond the capacity of routine remedies. The point, on which we rarely insist in everyday discourse, is that the emergency character of a situation inheres in the extraordinary and extreme demands made, demands that can be met only by a considerable amount of improvisation and that threaten to tax seriously the capacity of some organized behavior system.

*This paper was originally presented at an Emergency Operations Symposium, sponsored by the System Development Corporation, Santa Monica, California, in 1966. The editors of *Mass Emergencies* have felt that the article is of lasting value, and that it should be made available to the community of disaster researchers, planners and practitioners in published form despite the time-lapse. We are grateful to Dr. Robert C. Brictson (Michigan State University), coordinator of the symposium, for making this work available to us for publication.

ELEMENTS AND STRATEGIES OF PLANNING

The above distinction between an emergency and the event or external circumstances that act as its precipitating cause is the point of departure for our discussion of planning. To plan means essentially to create a structure with prescriptions for dealing with a range of anticipated contingencies. Elements within the structure of any plan include: (1) an ordering of goals in terms of some scheme of priorities; (2) the allocation, within the framework of these priorities, of available resources to achieve these goals; and (3) the development of routines in anticipation of contingencies whose characteristics and requirements can be predicted. Allocations are made within a structure that defines and limits the area of discretion within which spur-of-the-moment decisions with far-reaching implications must be made. *The basic goal of planning for extraordinary circumstances, it can be stated categorically, is to prevent them from creating an emergency.*

Routines, as well as clear definitions of when they are to be applied, are more easily developed where the occurrences with which they deal fall within the range of normal everyday experience. In hospitals, for example, the handling of "emergency" cases follows routine procedures. A fire, though an emer-

gency for its victims, is part of a fireman's daily work. A community will develop plans for coping with "emergencies" when they occur. Thus mining towns are better equipped on all levels to cope with situations that constitute a disaster. The extraordinary circumstances develop into what we have called an emergency only if inefficiencies, shortages, impending breakdowns, and so forth disrupt the usual means for coping with them.

Advance preparation and planning to improve performance in what may become an emergency reflects either a specific or a general strategy. A *specific* strategy presupposes that the major elements in the situation can be predicted in advance. Hence a plan will identify the objectives to be achieved, allocate priorities, prescribe the risks and costs to be incurred, and fix the appropriate procedures. In addition to anticipating as much as possible the precise contingencies within the situation, there must be routines for the quick and effective communication of information so that the needs and the resources to meet them can be quickly and accurately assessed and fitted into the order of priorities. Finally, there will be advance rehearsal of procedures deemed to constitute adaptive responses to those elements that can be anticipated. Any specific strategy involves a prior commitment and hence imposes some degree of rigidity.

A *general* strategy, by contrast, is geared toward flexibility to cope with the very elements that cannot be predicted in advance. Here the emphasis in planning is on a general priority of goals, with the allocation of resources and the means of achieving specific goals left to the discretion of those in the best position to judge. Measures embodying a general strategy are above all designed to stimulate resourcefulness, either by training in the solution of novel problems or by providing special incentives for innovation and initiative. The most troublesome task is to coordinate the adaptive responses spontaneously made by individuals and subgroups with one another. Lack of control may lead to complete breakdown at the community level, even while subgroups are effectively reacting to some of the unanticipated elements that caused the emergency.

THE EMERGENCY AS COLLECTIVE BEHAVIOR

Plans for operations under extraordinary circumstances, when influenced by social research, have usually taken the disaster as a model. Hence the focus has been on how to organize and effectively plan for rescue and other activities specific to the cause, nature, and impact of the disaster, the two-fold goal being to improve performance while preventing, limiting, and overcoming any disruptive behavior. In this respect a great deal of practical experience has been accumulated by groups whose members (like those in the various protective services, the medical and para-medical professions, and certain volunteer organizations) normally participate in so-called "emergency" operations. We could not possibly summarize all the lessons to be drawn from their experiences, and this paper will make no attempt to deal with the technical aspects of these operations. The approach is different. The perspective is analytic rather than prescriptive. Specifically, it endeavors to come to grips with some general problems relevant to planning and to do so within the theoretical framework of collective behavior. (This perspective is further detailed in Lang and Lang, 1967.)

Collective behavior is that field of sociology which deals most explicitly with the sequences and patterns of interaction that emerge in problematic situations of all types, emergencies being but one illustration. A situation is problematic insofar as the conventionally shared expectations break down and participants therefore lack adequate guides for orienting their conduct. Specifically, the presence within a situation of novelty, attrition, crisis, choice, competitiveness, conflict, or any com-

bination of these, contributes to the problematic, and collective behavior in these circumstances is inevitably bound more closely to what participants feel and directly experience at the particular moment than in situations more completely structured. These same elements of novelty, attrition, crisis, choice, competitiveness, and conflict can also contribute to the partial breakdown of structured activity in extraordinary circumstances. Each of these elements and its bearing on the planning of emergency operations will be discussed below. Responses under these conditions, before routines are re-established, are viewed as collective problem-solving.

From this perspective, let us probe a little more deeply into the conceptual distinction between an emergency and the event or extraordinary circumstance that acts as its precipitating cause. Any emergency caused by an external event (for example, a flood, a blackout, a Presidential assassination) can be further aggravated by ineffective problem-solving activity, whose disruptive effects pose additional problems – especially if the behavior of individuals or collectivities interferes with a remedial response. In other instances, however, the emergency is solely a function of the disruptive behavior itself. Civil disorders, traffic snarls, or hysterical epidemics can precipitate an emergency with the activities taken collectively, rather than some external event, as precipitating cause.

It may be useful to view the two types of emergencies – the one where disruptive behavior enters as a dependent variable, the other where it functions as an independent variable – as two successive phases within a sequential chain. This follows on the simple postulate that all disruptive behavior can be related to some set of antecedent conditions, even if their bearing on the behavior is not directly visible. For example, reports on what caused civil disorder in the Watts district of Los Angeles, which clearly brought on an emergency, identify a wide range of events whose cumulative effects, operating over time, provoked the outburst. Emergency operations obviously did not deal with these causes because, at the time, their exact nature was not clearly recognized and they could not, in any event, have been eliminated by decisive action on the spot. In other instances, however, the time sequence within which events occur is greatly compressed, the precipitating events highly visible, and the disruptive behavior likely to cease with decisive remedial action aimed at the removal of the cause, as in many kinds of disaster.

In the second phase, the behavior itself rather than the precipitating events stands out most clearly. The assumption here is that some disruptive behavior is characteristic of every emergency because the type of collective response to be made is itself problematic. Thus every emergency involves individual behavior, mass behavior, and organizational behavior* that are in some way responses to the underlying problem but that may at the same time contribute to the disruption of routines.

We turn now to the problematic situations that underlie all collective behavior and spell out some implications they have for the type of response to be anticipated under extraordinary circumstances. Taken up in order are: the importance of the degree of *novelty*; the effects of the extreme nature of the demands that, in different contexts, can culminate in *attrition or crisis*; and, finally, the implications of a variety of conflicts involving *choice, competition*, and mutual antagonism (*intergroup conflict*) that are at least endemic in any emergency.

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*Allen H. Barton, in his seminal article, "The Emergency Social System", in George W. Baker and Dwight W. Chapman, *Man and Society in Disaster* (New York: Basic Books, 1962), p. 224, points out that these three aspects of response constitute the major foci of recent disaster research.

THE DEGREE OF NOVELTY

Not every emergency is novel. Some emergencies – like hurricanes on Eastern ocean coasts, cave-ins in coal mining towns, or breakdowns in New York City's subway trains – are so recurrent that many participants have had prior experience with similar situations as either victims or rescuers and hence know what to expect and what to do. At the other extreme, there are events so extraordinary that no precedents can be found in the experience of those affected and no adequate organizational routines can be developed in advance to cope with them. The degree to which any emergency involves novel elements creates problems of defining the nature of the event, of what the appropriate response should be, and of the first in relation to the second. These have implications for behavior on the individual, the mass, and the organizational level.

On the level of individual behavior, inaction and inappropriate responses are more often encountered when the event is unprecedented. One kind of maladaptive response, identified as the "disaster syndrome" (Wallace, 1956), is exhibited by many survivors of major disasters who manifest extreme indifference and apathy, even after the first shock of impact wears off. The occurrence of the syndrome also hinges on the extreme degree of stress suffered, the suddenness of the impact, or the severity of the loss, against which the apathy is a defensive reaction.

However, the degree of novelty probably affects the likelihood that effective psychological defenses against stress and loss have been developed. Thus the "disaster syndrome" is less often observed where the extreme circumstances are more or less familiar. In World War II London, when raids and expectations of bombing raids became routine, humor served as an important protective device.

Inaction may be inappropriate because the special nature of the circumstances is not recognized. During the "Great Blackout" in the East in 1965, people tended to respond as they would to any sudden power failure; many of them did not turn to their transistor radios, hunt for candles, or do anything to prepare themselves for what proved to be a long night of darkness. Yet inaction is inherently neither inappropriate nor pathological. In the same blackout (so a Cornell researcher found) travelers entrapped in stalled subway trains followed an old and familiar routine by suffering the breakdown in glum silence, waiting for the trains to move again. "Virtually no communication emerged within the subway cars, even after transit workers made their way into the tunnels to describe the situation to them." (Columbia University, 1965).

Some kinds of inappropriate responses to false cues do not occur as an individual matter but depend on reinforcement en masse. Mass retreats or mass evacuations where objective circumstances evidently did not warrant such action invariably have been sparked by one or several persons whose behavior affected others so that immediately thereafter flight became general (Marshall, 1974). In a novel situation, where many participants lack the background to assess what is going on, the tendency to misread cues is accordingly greater. In these same circumstances, interactions among masses of people can produce improbable rumors. The less familiar the event and its probable effects, the more these will be believed.

Knowing where to turn for reliable information helps scotch some rumors. The role of transistor radios in keeping participants informed about the overall situation has been noted in such diverse events as the military uprising in Algiers, the Poor People's March on Washington in 1968, and the 1965 blackout in the East. However, media coverage can have contrary effects, depending on how the news carried is interpreted. On-the-spot radio coverage of civil disorders can help to inform would-be recruits to unruly mobs where they should go to stir up trouble.

Novelty also can leave officials and heads of key organizations uncertain as to how to respond. The most frequent failure is a delay in committing personnel and resources to emergency operations. Once committed, however, the actual imminence of the emergency can easily be exaggerated. This has particularly tragic consequences when police forces are moved into action and, misreading the danger inherent in the situation, use excessive force on peaceful demonstrators whose real intent is poorly understood. The well-chronicled shooting at Sharpeville in South Africa (Reeves, 1961) stemmed from an inability of police forces to cope with the novelty of peaceful organized protest by natives against a new and more restrictive pass policy.

Advance planning must therefore take account of the unanticipated and novel elements that inevitably occur in any set of circumstances sufficiently non-routine to create an emergency. Organizations cannot plan specifically for things they do not know will occur. However, the *appearance* of novelty can be minimized (so far as the mass of participants are concerned) if, in the dissemination of information, familiar and relevant, rather than extraordinary, elements are stressed. General provision for the rapid and accurate assessment of the total situation at some central point is, of course, imperative. But precisely because an occurrence appears novel to most people, ways must be found to make it appear as manageable. This means, among other things, (a) proposing specific things people should do, especially acts that have immediate practical consequences, and (b) incorporating volunteer activities that spring up within the total community effort by providing resources, information, and recognition.

ATTRITION

An emergency that is prolonged quickly loses its novelty, and attrition begins to become the major source of breakdown. Attrition is a gradual wearing down, a weakening of the motivation to support unusual effort. Some element of attrition is bound to be present in all but the most short-lived emergencies. This is because the special effort required cannot be sustained indefinitely at the required level of commitment without some breaks in efficiency. Hence the persistence over time of an apparently irremediable difficulty, or of a prolonged threat or deprivation, progressively leads to apathy and other forms of demoralization, in which private goals begin to gain ascendancy over the cooperation effort. During such long-lasting difficulties as epidemics, chronic unemployment, prolonged bombing raids, and persistent threats of a major catastrophe, attrition will produce side-effects that are disruptive of group efforts over the long run.

The effects of attrition in an individual are manifest in a variety of ways. Let us first take the case where a continually threatening possibility fails altogether to materialize. Measures designed to keep the threat focal will not suffice to maintain vigilance, because the threat ceases to be real. On the other hand, continuous operations under extreme conditions, where the threat is constantly reiterated by everyday occurrences, gradually erodes the motivational supports on which the capacity to withstand severe stress is founded. The progressive failure of emotional adaptation is evident in increasing irritability, hostility, and other "startle" reactions, because direct confrontation with the possibility of personal loss or injury can no longer be avoided (Janis, 1962). Strong social inhibitions facilitate the conversion of the accumulating effect into psychoneurotic symptoms, with their open expression in clearly deviant behavior as an alternative should these constraints lose their efficacy.

Attrition becomes a mass phenomenon when these effects occur in many individuals all at the same time. In the case of a persistent

potential threat, the sense of danger comes to be minimized by a growing collective disbelief about the actual possibility – as for example, the illusion that war is impossible (actually "unthinkable") because our weapons are too destructive. By the same token, the cumulative irritability aroused in circumstances that involve extreme danger or unusual effort is sometimes converted into a collectively shared hysterical belief that interferes with effective remedial action directed at the real source of difficulty. Collective beliefs can also be expressions of growing irritability and provide justifications for its displacement in hostile action against visible and available targets.

Attrition is, at the same time, an organizational phenomenon. Its progress can be indexed by a rise in various kinds of deviancy after periods of cumulative stress. To cite an illustration: military psychiatry recognizes that neuropsychiatric casualty rates of units follow certain patterns (Glass, 1975). There is a gradual but steady climb once the days of continuous combat exceed a tolerable limit. More sudden increases occur after a unit has suffered heavy casualities or when the unit commander begins to "crack up." These rates are group phenomena and their effect is cumulative. There is a progressive erosion of the interpersonal and formal organizational controls by which deviant tendencies are kept within tolerable limits.

In planning, one recognizes that there are peaks of efficiency and that, once these are passed, neither extreme vigilance against a possible threat nor extreme effort to overcome an extraordinary situation can indefinitely be sustained. Most generally, such an observation implies the need for explicit provisions to prevent unavoidable deviance from having adverse effects on the motivation and performance of others. Such provisions include a system of rotation and relief that finds acceptance because it is in accord with norms governing the allocation of risks. At the same time, there must be special channels for removing deviants and giving them less demanding roles that at the same time offer opportunities for therapeutic activity. Extreme disciplinary sanctions lose their efficacy after a while; caution must be used in their application and due regard paid their acceptability among personnel facing an identical situation.

A closely associated problem is that of projecting the correct situationally oriented role-models. Playing up heroic action during a disaster, when such action has little utility, can have disastrous results. The limitations of heroism were brought home to Negro leaders who, in Watts and other areas, exhorted rioters to go home only to find themselves objects of the crowd's wrath. Nor did the heroic escape role, which the press is so prone to play up, help the POW interned in a strange and hostile country where racial characteristics precluded the possibility of successful disguise (Biderman, 1963). Less dramatic acts must be given their due importance. Thus tips on taking care of one's own feet, broadcast during the New York transit strike, were more helpful than the dramatization of individuals who had traveled unusual distances, a feat that most people could not have matched or sustained over the long days of the strike.

CRISIS

Extraordinary demands during an emergency create a crisis, when the point is reached at which they strain the capacity of some organized system to make an adequate response and the system is on the verge of breakdown from the overload. Whereas attrition is a process of unavoidable deterioration operating over time, the crisis, by contrast, identifies a point at which demands begin to exceed capacity and the success of an operation is jeopardized. Difficulties in mobilization may mean that the point of crisis comes early in an emergency. Often, however, the point of crisis is reached only after reserves have been depleted and attrition has undermined the effectiveness of

the control structure. The symptoms of a crisis situation are the sense (a) that things are getting out of hand, because of confusion, failure to establish effective communication, and non-coordination of activities; (b) that resources are being depleted and will not suffice; and (c) that the time available for remedial action is running out.

The concept of crisis can only be applied to a behavior system, that is, an individual or an organization. There is nothing corresponding to the crisis on the level of mass behavior. A sense of crisis provoked in an individual by a fear of failure rather than by a personal loss or injury usually leads to emergency mobilization (Basowitz, 1955). On the organizational or community level, disaster, riots, strikes, etc. are sometimes not treated as emergencies until they have reached the crisis stage, even though the whole point of emergency operations is to prevent the crisis from occurring by providing mobile reserves to be committed as needed.

Planning to prevent a crisis has a built-in danger: uncertainties in the external environment that cannot be predicted or controlled result in an overconcern with the problem of internal order. The new rigidities so created can interfere with a fully adaptive response.

This concern with internal management exerts pressure to adopt specific strategies and elaborate regulations to deal with every conceivable emergency situation. Detailed procedures, though useful up to a point, can lead to an over-rehearsal of roles that is apt to stifle initiative and reduce the capacity for innovative action. A study of a tornado has pointed to the inappropriateness in an unanticipated emergency of medical activity governed by habits and practices designed to treat the type of emergency case that is routine in normal hospital operations. Best able to adapt to the extraordinary demands of the situation were physicians with prior front-line service. They were more ready to disregard and deviate from standard practices (Baker et al., 1953).

Organizational resources and effort may also be deflected from external contingencies into record-keeping, which assures its managers that all is in good order, or into creating a public image, which is to assure the agency the "social credit" needed for further fund-raising activity. An analogy with military inspections, close-order drill, and parades seems hardly far-fetched.

To forestall a crisis, there may also be a hoarding and husbanding of resources in anticipation of future contingencies that never materialize. This sometimes keeps supplies and personnel from being committed where most needed. The greater likelihood, however, is for an over-reaction out of the feeling that the crisis point has been reached. In cases of threatened civil disorder, the temptation to take pre-emptive action is hard to resist. Here, the attempts to avoid a crisis have sometimes precipitated a greater crisis, as for example, when operators in Glen Echo Park closed down their amusements, fearing their facilities would be overtaxed, resulting in riotous behavior and considerable property losses.

CHOICE

Emergencies are by nature choice situations because they require quick decisions among alternative courses of action before their full implications can be assessed. This type of choice situation gives rise to internalized conflict, the intensity of which has situational and sociological determinants. Thus internalized conflict will be more intense where the situation contains no clear guidelines for making a choice or where conflicting group affiliations contain sets of obligations that are incompatible with one another. Most routine situations contain little choice. There is an accepted preference ordering of the various alternatives with regard to their desirability and potentially conflicting obligations are successfully compartmentalized in time and space. Thus relatively fewer dilemmas arise in the normal course of events.

The origin and nature of such internalized conflict during a disaster has been fully detailed by Lewis M. Killian (1952) and we can do no better than take his inventory as a guide, adding some categories of our own.

Perhaps the most far-reaching reasons for such conflicts are primary group obligations whose demands compete with those stemming from membership in a secondary group. Primary group membership imposes obligations of a pervasive character and extends to all areas of activity. The obligations attached to membership in secondary groups are most impersonal and, therefore, do not have this pervasive character. Consequently, many persons who participate in emergency operations as members of a secondary group, if not reassured about their families, experience considerable conflict over the primacy of their obligation that lowers their effectiveness as participants in rescue operations (Form and Nosow, 1958).

A second type of conflict is between action based on personal knowledge of what is most needed and directives from higher quarters. The limits of discretion are not easily established in advance. On the one hand, a person responsible for local operations is in a better position to assess its requirements than his officially designated superior far removed from the scene; on the other hand, the tendency to exaggerate the needs of the local situation is irresistible for those too closely involved and thus unable to maintain their perspective.

Another source of potential conflict involves the short-term requirements of the immediate situation versus more long-range social objectives. Such conflict is certainly not unique to emergency operations, but the sense of urgency in extraordinary circumstances tends to shorten time perspectives. There may be impatience about the slowness of officials to adopt certain steps out of a concern for the legal implications or the fear of setting precedents. Action to restore public order and prevent damage has to consider the lasting residue of hostility that any excessive use of force, no matter how justified, can leave among its victims.

The relaxation of institutional patterns creates conflict between primary values oriented toward people's life, health, and general well-being and secondary values oriented toward property, status, legality, and so forth. When primary values are endangered, secondary values lose some of their salience. Yet, conflict arises even about whether people should be urged to abandon their homes and seek personal safety or whether they should be encouraged to participate in the effort to preserve them from a fire or flood, even at some personal risk. The violation of property rights to decrease the suffering of victims is still another version of this conflict. The employees of a concern may be compelled to resolve conflict between their loyalties to the "company" and their obligations to "fellow workers".

Another source of conflict is betwen identification with the community and identification with some partisan or extra-community group. This may be seen also as conflict between the goal of maintaining and restoring order versus the goal of pressing some partisan claim. Lewis M. Killian (op. cit.) invokes the example of the telephone workers who temporarily called off their strike. When union leaders declared the emergency over, they came in for considerable criticism from local townsmen as a result of which many union members resigned. Parallel conflicts occur between partisan leaders who seek to use civil disorder to press their claims but who come under criticism, irrespective of the intrinsic merits or justice behind these demands.

A final form of conflict exists between the alternatives of playing a heroic role that gains a certain amount of glory or of continuing to pursue what is a mundane but nevertheless essential occupational role. The problem of appropriate role models for emergencies has already been discussed.

No amount of advance planning can eliminate all these internal conflicts. However, the clarification of priorities among competing demands together with an assurance that vital needs, such as the safety of family members, are provided for (or will be provided for) can probably reduce disorganization due to such conflicts. The important point is that goals not officially recognized in emergency operations at least receive consideration as elements that may influence the success of any plan.

COMPETITION

Competition is here treated as an ecological form of conflict among populations for scarce resources and for survival. It involves conflict en masse. A reward structure in which the gain for any person must necessarily be at the expense of another favors an individual rather than a cooperative response to the problem (Mintz, 1951). In the competitive situation, the problem for the individual is simply one of finding the most rewarding among available alternatives. But on the level of mass behavior, the problem becomes how to maintain a reward structure in which the undesirable consequences implicit in a convergence of individual choices can be kept from foreclosing alternatives, the availability of which would increase the gain for all.

The most common manifestations of ecological conflict can be traced to competition. Its implications are greatest where the convergence so produced has cumulative effects. Thus, physical convergence creates bottlenecks that interfere with escape and rescue operations. During World War II, civilians fleeing before the German advance deprived the French army of roads they needed to bring up reinforcements with which to stop the invader and gain time to forestall the apparently inevitable military collapse (DeLong, 1956). Similarly, the behavioral convergence of choices on an object is capable of creating serious shortages, the very thing against which scare buying and hoarding by individuals is meant to protect. In 1948, when the Russians in sealing off West Berlin also cut off its major water supply, fears of shortages led to an overuse of water by people who filled their tubs in the eventuality that the faucets might dry up. The precariousness of the water supply notwithstanding, Berliners were officially encouraged to continue to use water just as they had before, and as the water kept on flowing consumption returned to normal levels just before the reserves were depleted (Phillips Davison, 1958). In this instance, the emergency was overcome by imaginative action. A reward structure favoring an individual solution was prevented from becoming competitive.

Convergence is always a possibility as long as people have the capacity to move and to act. Nor would it necessarily be desirable to eliminate it altogether. The focalization of activities and of attention on an area where an emergency has arisen encourages the concentration of resources and services. While much has been written on sightseers and looters, who add to the difficulty, the convergence of the news media to the scene of nearly any emergency lends encouragement to local efforts. The glare of publicity also holds promise that any glaring violation of norms or any failure in emergency operations will immediately be exposed. Ample on-the-spot news coverage by the electronic media likewise relieves somewhat telephone circuits that might otherwise be overloaded with callers who seek information. Some undesirable side-effects of such coverage have already been mentioned.

A plan to prevent convergence during an emergency has as much chance of success as a plan to stop the morning rush hour from materializing. Steps can only be taken to minimize its potentially harmful effects by channeling movement, rather than blocking it, by providing assurances that certain kinds of nonroutine actions are unnecessary, and by dramatizing positive examples set by public leaders

and others. The point is to seek control at critical points – for example, rounding up of gangs, agitators, and disorganized elements patently taking advantage of a confused situation – in order to set a proper tone and prevent changes in the collective definition of the situation.

CONFLICT

By conflict we mean those open expressions of antagonism between organizations or individuals who act as the representatives of organized groups. Certainly the element of conflict, when present, contributes to the unpredictability of responses. Conflict has its own dynamic. Latent distrust and prejudice, when they erupt into active enmity, can create an emergency and the escalation of fear, hostility, and suspicions in the course of conflict, to magnify the original cause of dispute so that both violence and treachery come to be condoned and serious efforts at negotiation can only follow after an open test of strength.

Where violent conflict itself is the cause for the emergency, as in instances of large-scale rioting, participants in operations to restore order almost inevitably become a party to the conflict and are not simply the guardians of law and order. Police operating as rescue units or firemen in the act of extinguishing a fire have found themselves objects of mass hostility. Attacks on fire equipment are a rather recent arrival on the American scene, but firefighters have long been favorite targets of riotous crowds composed of the most abjectly poor inhabitants of the larger cities of the Orient. When parties seeking to re-establish order do not move in quickly and with clearly superior force, their very presence can contribute to the kind of reactive interaction that culminates in an escalation of animosity.

Civil disobedience and public disorder are the likely means of conflict when effective channels for the airing of grievances are unavailable, whether from inability to articulate one's demands or because the dominant party is unwilling to enter into serious negotiations. It does not follow, however, that meetings during the heat of conflict always operate as safety valves to cool off tempers. Such meetings have often misfired because inflammatory remarks before a susceptible audience can further stir up hostility.

Emergency operations may involve a variety of conflicts such as those between the several organizations already in existence, between ad hoc committees especially formed for the emergency and well-established organizations, or between several individuals or groups who are competing for leadership. Conflict may also erupt between different segments of the population whose members believe themselves subject to differential treatment. The intensity of such conflicts is often exaggerated, and they manifest themselves chiefly after the peak of the emergency has passed and assessments of performances are made in terms of praise and blame. Their effect during actual emergency operations themselves seems largely a matter of less than full cooperation.

A prime consideration in moderating the inevitable conflicts that do occur is the maintenance of contact with already established leaders of organizations and at the grass roots level to assure that the intent of any measure is thoroughly understood. The point to recognize is that an emergency outfit whose activities are not fully acceptable to the population they are meant to serve is never fully immune from attack. However, the potentially positive role of leadership in preventing animosity from escalating into conflict, containing its spread if it should erupt, and bringing it to a halt needs a more careful consideration than it has so far received.

SUMMARY

The preceding has briefly dealt with some elements in problematic situations as they

relate to emergency operations. Each one of these elements contributes to the kind of problem-solving pattern that emerges. The element of novelty refers essentially to the unprecedented aspects in every emergency. If they are minor, reactions to the emergency take on many of the characteristics of a routine operation. In contrast to novelty, which may or may not be present, attrition and crisis have reference to the extreme nature of the requirements. Some distinction between attrition effects, which have a cumulative effect over time, and the nature of a crisis, which is the point of proximate breakdown, is necessary to explain why after a crisis has been successfully weathered a lowering of efficiency may nevertheless set in.

Choice, competition, and conflict are elements in the interaction rather than of the events to which emergency operations must respond. The different levels at which conflict occurs – internal conflict, ecological conflict, and conflict among organized groups – permit us to deal conceptually under a single rubric with the consequences of any strategy followed in planning.

Finally, this analysis of emergency responses draws our attention to the limitations of any specific strategy for coping with extraordinary circumstances. The nature of these events defies the imposition of any prior structure. Hence, all planning must be flexible and contingent, with planners and participants kept aware of the emergent elements responding to the situation. A useful differentiation between specific contingencies that can be anticipated and general possibilities for which those in charge of emergency activities should be on the look-out seems essential. Above all, thinking about emergencies must not be allowed to deteriorate into doctrinal reassertions of procedures that are likely to contribute more to an anticipatory sense of security than to effective innovation when confronted by the press of events.

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THE BEHAVIOR OF SURVIVORS AND VICTIMS IN A JAPANESE NIGHTCLUB FIRE: A DESCRIPTIVE RESEARCH NOTE

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In this paper we describe the range of behavior of persons in an immediately threatening fire situation. In particular, we wish to differentiate the behavioral responses of survivors and victims. The descriptions are drawn from interviews with survivors and persons who assisted in rescue and fire-fighting efforts, as well as post-disaster observations at the scene of the tragedy. A major effort was also made to plot graphically the physical movements of those involved in the situation.

First, a very brief account of the disaster is presented. This is followed by a discussion of certain patterns of behavior engaged in by those who fled and survived the fire. We conclude with a somewhat more speculative assessment of the different types of behavior displayed by those who died in the disaster.

THE DISASTER

On March 13, 1967, at approximately 10.36 p.m. a fire broke out on the third floor of the clothing section of the Nichi department store. The fire was caused either by cigarette smoking or possibly by matches discarded by electric utility workers who were working late that night. When the fire was discovered, it had already developed considerably and was out of control. Even young, strong utility workers were barely able to escape the fire by climbing down to the ground on already burning billboards at the front of the building.

As it turned out, the fire eventually burned out only the third and fourth floors of the building; but smoke went by way of an air duct to the seventh floor where the Cabaret Playtown was located. People trapped on that floor opened the doors of the central staircase, thus allowing smoke to pour into the club, and the result was a major catastrophe. Out of a total of 179 customers and employees in the club, only 61 survived. The other 118 died. Of those who were killed, 22 died as a result of jumping from the building. The rest died as a result of suffocation from carbon monoxide poisoning. None of these victims was directly burned by fire. Survivors got out of the building in several ways. Some ran down the emergency stairway when the smoke appeared; a few other people came down by the elevator when the fire was first noticed. Several people, determined to survive, escaped to the ground by way of an emergency fire ladder. However, many people fell because it was not fully or properly extended, its operating mechanism was old, and because of the crush from the number of people who were trying to use it. All other survivors were rescued by ladders put up by the fire department during its rescue efforts.

THE BEHAVIOR OF SURVIVORS

It appears that those who survived and those who died in the fire behaved differently. Three kinds of survival behavior were noted.

Behavioral Pattern One. The first type of survivor behavior is illustrated by the actions of two women who ran quickly down the emergency stairway. This stairway faced out towards the street: this protected it from heat and smoke until the fire had grown quite large. On the other hand, the stairway was located in an unfortunate place, i.e., near the elevator shaft from which smoke was billowing. Furthermore, the entrance to the stairway was hidden behind a curtain in front of a cloakroom counter and the elevator. Thus, it was not visible to employees, waiters or hostesses.

The first person to run down the stairway was a woman who worked at the cloakroom counter. She smelled the smoke coming from the elevator and told a waiter about it. Then she ran down the stairway through the heavy smoke. The woman's behavior seems well ordered; perhaps it can be described as normal. Another escapee whose nickname was "Baisho" followed the same route. Her escape, however, was far more difficult and much can be learned from her survival process. She was in the same vicinity as the first woman, Ms. A. Her recognition of and reaction to the fire did not significantly differ from Ms. A's, except that she tried to reach the stairway later through the smoke and resistance of the crowd. After several attempts, she went to the rest room, where there were already many other customers, some unconscious. After vomiting, she found water and wet a piece of cloth. Holding the wet cloth, she controlled her breathing and finally dashed back to the stairway. She pushed open the curtain, and breathing some fresh air, ran down the stairs. On the way down, she was helped by a fireman.

How was she able to do all this in spite of the terrible smoke? How did she succeed in escaping? Certainly her courage and determination to survive is clear. The use of the wet cloth was important. It cooled her body and protected it from the heat and smoke by acting as a shield and filter. There was, however, a more important factor in her specific case. She always went home by this stairway. The manager of the Cabaret Playtown used to tell the hostesses to use the stairway, since the elevators were for customer use only. Although most hostesses ignored this regulation, she kept it, either out of obedience, or because she was a loner. Whichever it was, her familiarity with the area and her daily pattern of behavior were the difference between life and death. This example indicates that survival behavior can be affected by prior knowledge. The importance of this factor in a crisis can be seen in any other similar situation.

Behavioral Pattern Two. The second type of survivor can be observed in the behavior of the newly-employed waiters. Many of them were part-time workers. In the crisis, the waiters returned to their own room where the windows faced the street. This pattern of behavior showed that people often return to the familiar and to habit in times of crisis. For example, one of the newer waiters was told by an experienced waiter what to do in case of a fire. He took the fire extinguisher out and tried to stop the smoke coming out of the air duct. This did not work. Since he could not think of any other way to stop the fire, he fled to his room. The room was insulated from the main hall by two doors. Since the windows of the waiters' room faced the main street, the fire truck's rescue ladder was able to reach it easily.

The behavior patterns of the older waiters were not as simple as those of the part-time waiters, but even they returned to the waiters' room. Let us consider Mr. B's case. Mr. B was standing near the front counter taking a customer's order when suddenly the kitchen area became noisy. He immediately went to the kitchen and found the thick smoke coming out

of the air duct. Neither buckets of water nor the fire extinguisher were able to stop it. He felt that his life was in great danger. First he decided to rescue customers and went to the elevator area. Heavy smoke was already coming from that area, too. Suddenly he thought about the theater adjacent to the Cabaret Playtown, whose interior was being remodeled. He remembered that the wall between the two buildings was only a wood veneering. If he could break the wall, people could perhaps escape into the larger theater next door. He opened the curtain and asked customers to go through the veneer door. Many people followed him, but when he went in, he found that the veneer panel had been replaced recently by a cement block wall. It was useless to attempt to break through the wall. The smoke was choking him. He saw another waiter, his friend, next to him hitting the wall with a broken piece of block. He tried to stop him and motioned him to get out of the dead end. Some people got out with him, but many remained in the area, jostling each other. When he was out, he saw the manager heading toward the door which led to the central stairway. There were perhaps twenty to thirty people following him. The manager tried to open the door by lifting it with his hands, but to no avail. He remembered that there was an electric shutter-button somewhere near. After searching, he found the button and pushed it. The door opened. He thought there was a door leading to the upper floors approximately ten meters ahead of him. Twice he groped for it, but he could not raise his face because of the suffocating smoke. The gathering crowd was scattered by this smoke. Some ran from it, others tried to get through it. The crowd turned into a mob and absorbed him. Unable to breathe properly and gradually losing consciousness, he wondered if he would die there, and the thought made him feel sorry for himself. He started to cry. Crawling on the floor, he happened to touch the stage in the dark. The whole layout of the area became clear in his mind. If the obstacle he was touching was a stage, then it would lead him to the waiters' room where there was a window. He might be able to breathe there. Crawling on the carpet where the heat and smoke were thinner, he reached the waiters' room. Continuing, he came to the guest star's room and finally was rescued by the fire department with a rescue ladder.

In his case, we can see that he too survived by returning to his usual place, although he knew well the various escape routes and could tell the layout of the main hall in the dark by a lucky touch of the stage. The fact that he was physically strong and did not drink alcoholic beverages, in contrast to many of the customers, increased his chances of surviving. When the first escape route did not work, he tried another while conserving his energy. It would not be too much to say that what enabled him to escape was his thorough familiarity with the building.

Behavioral Pattern Three. The third type of survivor is represented by Ms. A and other customers. People of this type were rather overly cautious; this delayed their recognition of the fire. Because of it, they were not involved in, nor absorbed by the mob. They were also close to the window side of the room and far from the entrance and other exits, and it was this that led to their survival. This can be compared to a situation in which someone missed a bus ride and thus saved himself from an accident. Ms. A was pushed by the mob and could not reach the elevator area. As a consequence, she was separated from the chance of death in the dead end between the Sennichimae theater and Playtown, from the smoke coming from the elevator area and the kitchen area, and finally, from the mob which moved around and died in the central open space.

Those at the outer edge of the central open space could reach the window side, although scattered chairs and sofas blocked their way. When they reached the windows, they could breathe the fresh air and see the

rescue activities going on outside where the fire department was trying to reach the windows with a rescue ladder. Heartened by the increased possibilities of survival, they could tolerate the heat and smoke. In the case of Ms. A, she was uncertain about the possibility of escaping via the rescue ladder, and thus had a higher level of anxiety than the people on the window side of the hall. There people could tolerate the burning heat and choking smoke,because they could see that some hostesses had already been rescued by the ladder. People can often tolerate physical pain as long as they are informed, but not when they are in a state of uncertainty or anxiety. Thus suicidal jumping took place. Perhaps to wait for rescue meant death, as did jumping off. The chances were equal; thus the survival expectation became higher. The people who jumped off actually maintained a high degree of endurance and tolerance. Others came out of the dead end and escaped through the central open space. According to the testimony of Waiter B, many people had already fainted when he approached the stage in the dark. Thirty-six minutes passed between the start and the end of the rescue work, which according to the records of the fire department lasted from 10.47 to 11.23 p.m. Many people must have fainted within two to three minutes. It can be estimated that death occurred within four to five minutes. In spite of this, some were able to tolerate the heat and smoke of the fire for as long as thirty to forty minutes.

THE BEHAVIOR OF THOSE WHO DIED

Behavioral Pattern One. Among those who died, the first type consists of those who perished in the dead end between Playtown and Sennichimae theater. They banged and scratched the cement wall in vain. Approximately fifteen bodies were found in this area. We can guess that these people reacted more quickly to the fire. The smoke must have been thinner at the time the waiter was saying, "Come this way, you can escape". The people came to the dead end later and seemed to have desperately moved around to find a way out, since they could not go to the front desk area. First they went to the elevator area, then were pushed back by the huge clouds of smoke, then followed the older waiters. All went into the dead end with the first group of people. These people were perhaps quick to move and geographically near the entrance. About fifteen people recognized the situation as a dead end and turned back. Considering this, the actual number of people who entered the dead end must have been higher at one time.

Let us consider the psychological effect of the situation in the dead end. Someone started banging the cement block wall, then the other people started doing the same with a piece of cement or whatever was available. The author of this article has seen the scratches on the wall. It was certainly a miserable and disastrous scene. Why could they not move to the other places? In a crisis situation, people lose flexibility; it is part of human nature to do so. There was another tragedy caused by the large number of people moving around. Some persons who entered the dead end could not get out because incoming people blocked their way. They were thus trapped by the human obstacle.

Behavioral Pattern Two. The second type of people who died consists of those found in the central open space of the hall. How can it be explained that over thirty people died piled up in the central open space? This was the first question that came into the author's mind when he saw the pictures in the newspaper. The very peculiar feature of death in the central open space is the one most representative of the consequences of milling masses of people. When the first people to react decided to escape, they went to the elevator area and then were pushed back by the smoke and absorbed into the no-exit

area. Finding this to be a dead-end, they followed the manager. In an unknown and unfamiliar place, under desperate pressure, the only and best thing to do was follow the person in authority. Hostesses knew the manager was the most authoritative figure, since he usually gave them orders and was also supposedly the most knowledgeable person. When this authoritative figure ran toward the central stairway, approximately twenty to thirty people followed him. The other large number of people driven from the elevator area started following him too. Waiter B said, "We escaped from the dead end and wanted to go to the waiters' room, but I saw the manager going to the central stairway with about twenty to thirty people with him". Then the shutter of the door opened, and this is where the last catastrophe occurred. The heaviest smoke came out of this central stairway. The milling mass spread out again and retraced its steps, heading toward the elevator. The thick smoke blocked people's vision. People following the manager suddenly faced the reversed milling mass storming toward them. The opposing power of the two masses created a crush of people. The first person, perhaps, fell on the floor, tumbling, legs twisted and upside down. The people at the bottom of the pile could not help breathing gas deep into their lungs. As they resisted, they lost consciousness. The mass trapped these potential survivors, and they were crushed. In a generally crowded place like Playtown, a large open space becomes a very negative element when a fire or similar disaster occurs. People will be pushed towards the corners, sliding along the wall until they come to an obstacle. If there are not any obstacles, they will be pushed all the way to one of the four corners and finally stop. Thus, usually these corners are disastrous places. In the case of Playtown, there was a young hostess who was found dead in a small locker. The rescue party found her body there and tried to pull it out, but it was so tightly wedged that they had a difficult time.

Behavioral Pattern Three. The third type of death is no less cruel than the first and second. Twenty-one people died who jumped out the window toward the roof of the arcade and fell off the rescue bag. These people did not fall one by one as their tolerance weakened. Instead, according to a policeman, after the first person had jumped, the others started jumping off, falling like rain. People on the ground could not come near enough to rescue them after they hit the ground because it was dangerous to do so. Many people on the ground could not bear to see this suicidal jumping. They started shouting at the people in the building, "Don't jump off, you'll die . . . stop!" This screaming made an extraordinary sound. But people did not stop jumping. Later, survivors from this area told us that they could not understand at all what people on the ground were shouting about. In a way, the shouting sounded something like "hoolay" to them as people jumped. Some of those in the building even felt angry about the "hoolay" sound. Actually the people on the ground were shouting as loudly as they could, trying to stop the suicidal jumps. Why did this happen? First, let us consider the ones who jumped off toward the arcade side. The roof of this arcade seems to be about the height of the third floor when it is seen from the seventh floor at night. No one jumped on the main entrance side because the distance between the seventh floor and ground is so clear and visible. According to one of the inspectors, the arcade lights were all on under the roof. When one sees the lit roof from the upper floors, a so-called "white-out" phenomenon occurs, similar to what happens at the South Pole under certain weather conditions when the helicopter pilot loses his sense of height. Perhaps the same kind of sensory loss of perception of height led people to hope for survival if they jumped. (Another example of the "white-out" phenomenon occurred when Ms. Fumiko Miura, the well-known Japanese singer, was staying at the Oriental hotel in Kushiro, Hokkaido. The hotel caught fire while

she was there, and she experienced a very similar urge to jump from her room on the fifth floor to the first floor terrace). Regarding the arcade, it was very difficult for the fire department rescue party to approach that side because the arcade was in the way and the ladder could not be brought close because of the arcade roof. People in the building on this side could not see the rescue activities on the front side at all; this might have prevented their seeking other means of escape. Their backs were burning hot and the smoke was choking them to death. They approached the limits of tolerance and still saw no improvement in rescue possibilities. The situation looked so desperate that to wait another few minutes without any action seemed to promise death. Pain and torture increased. The arcade roof under the "white-out" phenomenon seemed temptingly close. The positive aspect of that possibility was constant from the beginning, but the negative aspects of staying where they were increased with the smoke and heat. People finally lost their self-control. They watched the first person jump. Someone was unable to hold on to the window frame and fell. Just as a tiny spark causes gunpowder to explode, catastrophe comes from these beginnings. People jumped off like raindrops and lost their lives as they crashed on to the ground.

No one would dare to risk this kind of suicidal gambling in ordinary circumstances. If each person had been acting independently, no such mass of people would have jumped from the building. Without question, this clearly shows the horror of some mass behavior during an extreme stress situation. To a greater or lesser extent, this kind of dysfunctional behavior also occurred in the use of the rescue bag. In this case, the problem was why the bag was not opened or used. The rescue bag was of no more use than a piece of cloth. Two waiters pulled the bag out of a box and set it on the ground. Both knew that the bag was an old-fashioned one, and had to have its mouth opened with the wooden arm. If what the waiters said was true, the milling mass of people became a mob; their behavior completely prevented using the rescue bag.

When comparing the results of an experiment on mice in a panic situation with the behavior that took place in Playtown, who can ignore an important implication of that experiment? In that experiment only one mouse escaped from the situation while five others died in the struggle to escape from a fire. It appears that the behavior of people attempting to survive can also lead to death of many of them.

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ACCOMMODATION TO THREAT*

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Because of the complexity of my subject, it would perhaps be helpful if I were to describe the breadth of its area. First, however, I would like to make a few preparatory comments about what I think we can and cannot say in this area – some of these comments are about a set of categories, or a checklist, that might be applied to considerations about accommodation to a threat. Essentially, I will, perhaps, leave you with the notion of the complexity of the area rather than the depth of our knowledge of it.

I think that we can make probabilistic predictions about what a person will do in response to a threat, and that we can make them fairly accurately. I say this in the context of probability prediction about the behavior of a person encountering a series of possible threats. On some occasions, we might be able to point to conditions when this kind of prediction would not be true, but most of the time we would be right. I think that we can make predictions about the behavior of large groups of people, particularly when there are some organizational or homogeneous factors that facilitate prediction. We may not always be right; there will be some deviance, certain inaccuracies, but probabilistically we will do quite well.

We may not always be able to predict the reactions of a person at a particular moment in time, but I think that we can predict sequences of reaction. In other words, given this event, what will happen next? Given that event, what will happen after it? Our estimates are particularly good, I think, when attempts to accommodate a threat meet with failure. When exposed to a threat, you often try something that does not work, so you do something else; if that does not work, you do something else. Failure itself becomes threatening, in addition to the situation you are trying to deal with.

Incompetence at handling the threat becomes a compounding factor, and we can predict the sequence of reactions. What we cannot predict is the pace at which such sequences will move. We do not know how long a person will persist in trying to do one thing, but we do know that after he decides that his effort is going to fail, he will then begin a certain alternative effort. So there is some probability of predicting a general time for this kind of change in coping with a threat.

We also cannot predict the success of his accommodations to threat. He may try one thing, and, if it fails, we know what he will do

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next; but his first effort might work. There are many factors, like weather, what other people do, luck, and these kinds of things, that make a particular accommodation to a threat functionally correct. This, too, can interfere with prediction because we do not know for sure what is going to work in the context of the hazard or danger.

As a psychologist, I have difficulty in explaining adaption to a threat in a psychological sense. This is partly a matter of vocabulary. I do not want to use the jargon of psychology because I think that psychology itself is changing. I think that some of the things we have acquired as knowledge during the last twenty-five years or so are interesting, but I also think that we need a background of information before we can explain them.

I will not talk about the problems of social reaction to threat – social organization, disorganization, reorganization, or rigidity of social response. I will not talk about the reactions to threat of people who have to make decisions – who have to lead – and who, because of this, have to treat the threat impersonally. It is not a threat to them. It is a threat to what they are responsible for. We have experts who adopt this role. For example, we have lawyers who are not particularly sensitive to threats to their clients. To them, it is a legal game; they know how to play it and are not emotionally involved with the problem of the poor defendant's reaction. The surgeon goes through a period of two, three, or four years when he learns not to be particularly sensitive to the feelings of his patient, at least to a certain extent. He could not carry out his job if he did not regard it as a technique, a technology requiring certain behavior on his part. Policemen in general have to regard things as black or white because they have to make decisions based on such judgments. I shall not discuss this kind of reaction to threat.

I shall not take a psychiatrist's or psychologist's standpoint in the sense of trying to distinguish fears that may be rational from phobias that may be irrational. Some people may regard white rats running around the floor as a threat, but I am not going to discuss the origins of that kind of thing or the reactions to it. Nor will I go into early childhood experiences and how they lead to deviation in some situations. These subjects are interesting and exotic, but I am going to be more general. I shall not talk about accommodations to threats to other people. I will assume that the person I am talking about is in a threatening situation himself. Nor will I talk about adjustment to surviving threat, although some interesting research is being done on this aspect of accommodation to threat – for instance, the research on the people who survived Hiroshima, their attitudes toward death, and the values that go with surviving.

What I am going to talk about begins with an assumed situation of threat. I will show, in a diagram, some reactions to the threat and give some notions of the variables and factors that must be taken into account if we are going to talk about such situations meaningfully.

In our lives, threat is so pervasive and ever present that it is obvious that we adjust and accommodate to it all the time. There are threats to us and also to our extended selves in terms of what we value in our environment. The mass media are filled with warnings, from threats of cancer from smoking and the hazards of pollution, to threats of dire consequences if we do not fill out our income tax forms correctly, or buy safety belts, or raise our children properly. We adjust to many of these without much effort; some cause us concern, others we ignore.

A great deal has been written on this topic – the points of view of writers in the fields of physiology, experimental psychology, social and clinical psychology, sociology, and so forth. It is also the topic of much that is called military science, and even political science and foreign affairs. There are numerous reviews of this material and I am going to assume that much of it is already familiar.

I will begin by sketching out a diagram of the parameters of the situation that are involved in reaction to threat. They are not exhaustive but they do represent a distillation of those variables which seem to be involved during the actual processes or stages of reaction. What is largely left out are those variables that have to do with the past experience of the individual, but I believe that these have some influence over the variables I have included.

Let us start with a threat that will become apparent through some form of information transmitted to the individual. This information must be understandable, and at least to some extent, credible. If it is not believed, there is no accommodation. If it is a very distant threat, like death, it can be dismissed with equal efficiency. If it is absolutely inevitable, one can do nothing but try to cope with one's own fear reactions.

These statements already describe three important parameters of information about a threat: its nature, its probability, and the intensity of fear aroused within the individual. By the nature of the threat I mean, in common sense terms, a description of the hazard. Any such hazard carries with it an estimate of the likelihood of occurrence in space and time, an estimate which will vary among individuals and is obviously subject to distortions of exaggeration or minimization. Whatever the consequent mix of threat, there is a certain degree of fear aroused. This is a physical reaction that will vary according to individuals, and will have to be dealt with, by the individual, as an increment to the threat.

Any rational person will, at this point, begin to think of, or inquire about, or look for some form of behavioral adaptation. In many instances this cognitive behavior is tied in with the definition of the threat and in many ways indistinguishable from it. In some cases a habitual response immediately removes the threat. In other cases behavior has to be planned, and in some cases behavior has to be learned or instructions have to be sought. Whatever the information available to the individual, information about adaptation has the parameters of the nature of the behavior required, its probability of effectiveness in coping with the hazard, and the effort required with its considerations of consequences and cost.

Put together, these variables describe the various perspectives of a threatening situation. They describe the degree and impact of danger. The somewhat rational appraisal describes the effectiveness of protective measures. The interaction of estimates about the suggested adaptation describes the motivational state of the

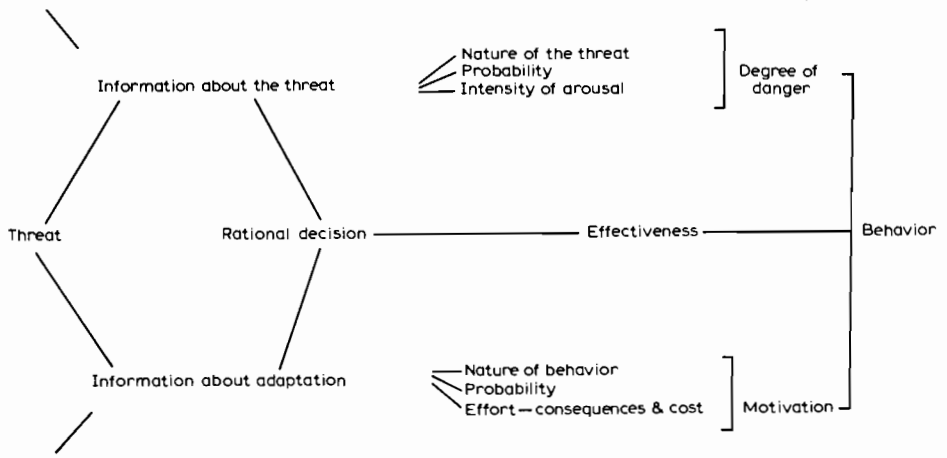

Fig. 1. Diagram of factors influencing reaction to threat.

individual. Together these factors tend to account for the behavior of the threatened individual. If we schematize these factors, we get the diagram as shown in Fig. 1.

It might be useful to make some comments on what we know about reactions to threat. The comments should provide an understanding of the function of some of the variables, although they will not offer a summary of what is known about the field of reaction to threat.

We know that people react to different threats with varying evaluations. Some people are particularly afraid of certain animals, or of social events such as making speeches, or of specific environments such as heights. People differ in their reactions to what is strange or curious or horrible. People differ in their ego involvement in a threat depending upon whether they own a house threatened by a flood or whether family members are involved in a danger, or whatever system of values tends to engage particular and unique feelings of involvement with what is threatened.

We know that people tend to underestimate the probability of threatening events. Often this feeling is described as a personal feeling of invulnerability. Any threatening message has to surmount this feeling of "this doesn't apply to me." There is, of course, a certain amount of truth in such a perception, since most of us have successfully avoided a great number of threats during our lifetimes. It is sobering when one sees an accident or comes very close to danger, but this mood does not last. In some areas where our experience has not been so successful, we do maintain a sort of hypervigilance and are particularly sensitive to cues of danger. As a matter of fact, in such areas we may distort probabilities so as to exaggerate the likelihood of a threat; but this flip-flop from optimism has very clear antecedents.

People also differ in the degree to which threat arouses physical fear. Our autonomic nervous systems react according to different degrees of sensitivity. Some of us walk around with chronic levels of anxiety that do not provide us with a needed handicap in the race to avoid states of great stress and intense fear.

It should also be noted that a certain degree of arousal is necessary for any response to be developed. People do not generally respond to purely cognitive recognitions of threat unless their job requires that kind of behavior. A certain degree of emotional arousal focuses attention and consideration and maintains a state of alertness long enough for some behavior to be developed. However, it is also true that intense arousal may be more distracting than facilitative. Extremely high emotional arousal interferes with adaptive behavior and is confusing. Such emotions become so preoccupying that all attention has to be given to them and reaction to the threat that precipitated them is suspended.

The work of Janis and Feshbach (1953) on this topic is the classical experiment in which intense arousal caused by the horrors of tooth and gum disease led to little adaptive behavior. Haefner (1956) found the same results with horrible presentations on fallout hazards from H-bomb testing.

Janis and Leventhal (1965) have come up with an explanatory model that tends to account for most of the data obtained on experiments of this type. They propose that arousal increases the probability of acceptance of a threatening message up to a point at which the facilitating effects of arousal are more than the interfering effects. After such an optimum point, further arousal is inhibiting and confusing. However, such an optimum point is not a sign on a continuum of intensity of fear, but is an optimum point for a particular kind of threat! Other threats may well have a different optimum point of arousal. The situation can be shown as the diagram in Fig. 2.

For situation "A" a moderate degree of arousal is optimal, but for situation "C" a much greater degree of arousal is optimal because of the greater threat that has to be accepted. Such a model would stipulate that no single degree of arousal is helpful or disorganizing

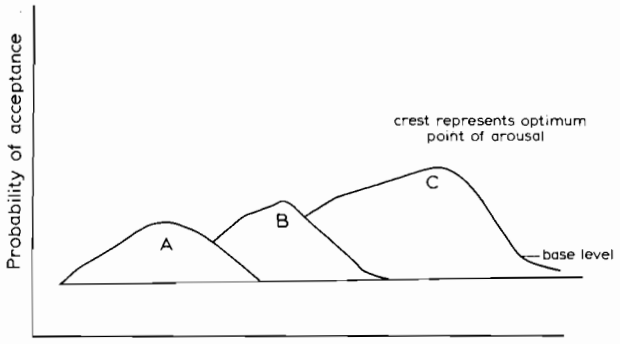

Fig. 2. Degree of fear arousal.

but that the location of the optimum point of the curve will have to be determined for each class of cases.

This consideration of the optimum point of arousal implies that we do not react very adaptively to little fears when we get very emotionally aroused, nor do we react adaptively to big fears with only moderate emotional arousal. What seems to be implied is that a threat must somehow be validated in terms of emotional arousal for it to be accepted in any terms that require behavior or adaptation.

This notion of balance also carries over into information about adaptive behaviors. We are not likely to behave defensively without some probability of success. The nature of a threat, as a matter of fact, is intimately tied in with our ability to do something about it. Pneumonia, for instance, is much less of a threat now that we have highly efficient drugs for curing it.

Adaptive behavior is much more likely to occur if a person is clear as to what adaptive behavior is required. If information about suitable behavior is vague or unclear, it is, to that degree, less likely to occur. Also, if there is not some clear connection between the threat and what one does about it, the protective or defensive behavior is likely to be inhibited. It is difficult to assay the probability of effectiveness of adaptive behavior unless one has some clear insight into the strategy of the adaptive behavior proposed.

People are also prone to be economical in their expenditure of energy required for adaptive behavior. Small threats require only small expenditure. The commitment of costly resources requires an even more costly alternative to their non-commitment. In experimenting with adaptive behaviors, there is a sequence from attempts at finding a cheap solution to a more costly one if the initial attempts do not succeed in extricating the threatened person from the precipitating situation of stress. It is analogous to the increasing commitments of a nation faced with hostile action from another nation in the escalation toward all-out war. It is also analogous to the increasing sacrifices of physical defenses against physiological stress.

The actual occurrence of adaptive behavior, however, requires more than just a credible threat and the existence of some adaptive behavior. Not everybody uses seat belts. Not everybody who could get an injection against flu takes the opportunity. Many who think that lung cancer has something to do with smoking refuse to stop smoking.

In an experiment, the value of tetanus injections was told under various degrees of awareness of the threat of tetanus. Those with more than moderate but less than extreme arousal found the message credible and acceptable. This was in accord with the model just described. However it was the information on follow-up – where to go, when to go, what having an injection meant, etc. – that made the difference in whether people got tetanus injections or not. Credibility of the message did not lead to behavior unless the supportive follow-up explaining adaptive behavior occurred. Similarly, one can point to several experiments in which clarity of information, personal commitment to do something, public resolve, group activity, etc., all act as supportive factors in gaining a follow-through to adaptive behavior.

There are also ways of life, training, and even personality factors that lead one person to behave rationally and deliberately more often than another. The factor that has the highest

correlation with seat belt usage is degree of education. Rehearsal and training tend to increase the probability of certain behavior occurring. An instructional set focuses attention on some behaviors more than on others. Further, particular roles in a disaster situation lead easily to certain regular, role-demanded, types of behavior for firemen, soldiers, policemen, physicians, ministers, etc.

Finally, it might be worthwhile looking at some of the factors that seem to lead to ill-adapted behavior. They are the opposites of many of the factors that have already been mentioned as facilitative factors in developing adaptive behavior. Four factors seem to be prominent in the literature: (1) Perceived entrapment, which might be interpreted as a sudden worsening of the threatening situation and the probabilities for effective action, is certainly conducive to panic and acutely disorganized behavior. (2) Separation from one's family or primary group is also disorganizing. Individuals often behave with what seems like disregard to their own adaptation in conditions where they cannot get to loved ones who are in danger. (3) For many people, witnessing injury and death is acutely disturbing and arouses such acute emotional response that it is overpowering. (4) The phenomenon of the "near-miss," which is a mixture of the factors of emotional arousal and sharp change in estimated probabilities of threat and defense, along with a feeling of guilt at having been spared from emotions of bereavement, often turns out to be completely disorganizing.

If a concept, such as that of "accomodation to threat" is to be discussed, and used, with the ultimate aim of pointing to practical implications, careful analysis of the concept and of its component parameters is required. Only then can it serve as a spring board for the derivation of more practical ends to which it can be put. In this paper, I have sought to perform such an analysis of one central concept in disaster research, "accomodation to threat".

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A NOTE ON NATURAL DISASTERS AND CIVIL DISTURBANCES: SIMILARITIES AND DIFFERENCES

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INTRODUCTION

Barton (1970: 37–47), in his well known work on the classification of the dimensions of disasters, has called attention to a generic class of social phenomena which he labels collective stress situations. He includes under this rubric a wide variety of events such as the sudden death of a head of state, earthquakes, ghetto riots, the economic decline of cities, explosions, political purges, air bombings, and the status deprivation of untouchables in a caste system. In addition to suggesting this general typology of collective stress situations, Barton outlines some of the dimensions upon which it is based (i.e., scope of impact, speed of onset, duration of the impact itself and social preparedness). However, he does not go beyond a general description of the common characteristics of these events although it is obvious that there are both similarities and differences among them.

In this paper we wish to note some of the basic similarities and differences between two of the major types of collective stress events, that is, natural disaster and civil disturbances. There are similarities. For example, each produces a large number of sudden demands which threaten and/or disrupt the normal flow of community activities and each often creates an imbalance in the social systems involved. This disequilibrium is correctly perceived as a threat to the community by its members, and as a consequence they set in motion a wide range of activities designed to restore a systemic balance. Apart from this basic similarity, there are a number of fundamental differences between events such as floods, earthquakes, hurricanes, and so forth, and civil disturbances. They have different patterns of origin, warning, scope and duration. And, in addition, they occur within differing consensual contexts. As a result of these differences, they produce differing demands on the communities in which they occur. In this paper we examine these similarities and differences in the context of their most common sequential development.

Our analysis is drawn from a general consideration of the literature on the two kinds of events, but more specifically from a detailed comparative study we undertook of two major natural disasters and two civil disturbances that occurred in the United States in the late 1960's (Warheit, 1968). Given the latter focus, it is possible our analysis will not apply fully across different societies, but that is a matter to be established by research rather than speculation. We also do not consider the complicated case of technological as compared with natural disasters, that is, with catastrophes such as air crashes, ship and building explosions and fires, and radioactive spill-outs which differ in

origin, scope, and so forth, from both civil disturbances and natural disasters (see e.g., Drabek, 1968).

Origin

One of the fundamental differences between all natural disasters and civil disturbances is the origination of the stressful agent. Earthquakes, tsunamis, hurricanes, floods and similar events arise in a community's physical environment while civil disturbances have their origins in the thoughts and behaviors of people and social groups. Natural disasters arise from non-social forces which are external to a community's social system; civil disturbances emerge from social sources internal to the system. Natural disasters occur as purposeless, asocial events; civil disturbances can be viewed as instrumentally initiated to achieve certain social goals which are in conflict with those of the wider society. (For a more complete discussion of the issues associated with this position, see Grimshaw, 1968, 1970; Gurr, 1968, 1972; Warren, 1969; Caplan, 1970; Tomlinson and Sears, 1970; Geschwender, 1971.) As will be noted more fully, this characteristic of civil disturbances has a profound effect on a community and its emergency subsystems in terms of response and recovery.

Warning

Another difference between some natural disasters and civil disturbances is the type and amount of warning each affords. Fritz and Marks (1954), Janis (1958), Grosser (1964), Anderson (1969), Barton (1969), McLuckie (1970), Drabek and Stephenson (1971), and Mileti (1975) have noted the crucial role that warning plays in a community's response to a disaster event. Many types of natural disasters provide definite clues to the likelihood of their occurrence; some of these are general in character, while others are quite specific. Hurricanes, for example, can be monitored, their speed measured and course determined; tsunamis can be reasonably predicted to follow severe earthquakes, and floods can be projected on the basis of meteorological and geographical factors. Civil disturbances, on the other hand, are more like earthquakes in that they provide little or no specific advance warning, and their occurrence is difficult to predict even when some general conditions known to be associated with them are present. Because of their unpredictability, civil disturbances pose serious problems for a community as it attempts to deal with the problems created by the emergency.

Duration

The duration of the collective stress situation is also extremely important in evaluating the impact it will have on a community and on the amount of time and resources required to return the community to some semblance of its pre-impact state. The duration of the disaster agent in natural disasters varies widely; tornadoes and earthquakes are usually over in a matter of minutes, hurricanes may last a few hours, while floods may last for several days. Major civil disturbances are probably more like floods than any of the other natural disasters, since they tend to last for several days and are marked by unpredictable alterations in location and intensity (see Abudu et al., 1972).

Variations in the duration of a collective stress agent are important to note since they affect the ability of a community to deal with the emergency. When the duration of the disaster agent is brief, such as in an earthquake or tornado, it takes community leaders a relatively short time to define the disaster situation, establish priorities and allocate the resources necessary to meet the demands created by the disaster agent. When the collective stress agent persists in a highly unpredictable fashion over time, as in a major civil disturbance, it is difficult to arrive at a single and static definition of the emergency situation, the establish-

ment of priorities becomes an ongoing process, the allocation of resources must be constantly reappraised and there is a great need for inter-organizational coordination and integration as first one organization and then another has the resources relevant to the community's recovery. The unpredictability of human behavior (the stressful agent) during civil disturbances is a significant problem for those attempting to deal with the crises being created. The human, volitional, anti-social dimension is rarely, if ever, a salient factor in community responses to natural disasters,

Scope

The scope of the two kinds of collective stress situations also varies. The threat posed by large floods, tornadoes, hurricanes or earthquakes tends to be a generalized one which affects or threatens the entire community. The Fairbanks, Alaska flood of 1967 is an excellent example. Transportation, communications, public services and most other community functions were severely disrupted for several days; more than 90 percent of the residents of the city were housed in public shelters at one time (Warheit, 1968). Civil disturbances, by contrast, have characteristically been confined to relatively small sections of the cities in which they have occurred. This is true even when the riots are defined as major ones. In Watts, Los Angeles, the disturbance was confined to about 45 square miles – approximately 10 percent of the city's area. And, although there may be a perceived threat on the part of those outside the site of the disturbance, the burning, looting, and sniping is generally confined to very limited areas. Ironically, those most immediately affected by civil disturbances are frequently residents of the same area as those actively involved in creating and sustaining it.

Community Contexts

As noted, the origins of natural disasters and civil disturbances differ markedly: natural disasters arise in the physical environment from asocial causes, while the community crises caused by the civil disturbances which occurred during the 1960's in the United States were social acts which represented violations of the dominant norms of life and property held by the wider society. These differing origins produce two distinctively different normative contexts. Natural disasters create a social context marked by an initial overwhelming consensus regarding priorities and the allocation of resources. This consensus is so pervasive that it frequently sweeps away, at least temporarily, long-established hostilities and divisions (Wenger and Parr, 1969). Individuals, small groups and community organizations unite in a common assault on the problems created by the disaster event. Often the efforts of individuals and informal, emergent groups are so pervasive that the primary tasks associated with search and rescue are completed before the community's formal emergency organizations get mobilized (see Raker et al., 1956; Form and Nosow, 1958; Parr, 1970; Forrest, 1972). This outpouring of citizen response is so extensive that it sometimes poses problems (e.g., traffic control, the fragmentation of resources and overloaded communications) for the official emergency organizations in the community.

This is not to say that everyone in an affected community wishes to have it returned to its former condition. Fritz (1961) has noted that even in natural disasters, some groups may perceive the disruption of the social situation created by the disaster as desirable and may attempt to use it to effect changes in the social order. This desire was, of course, a component of the community crises created by the civil disturbances. There is, however, a basic difference between the latent aspects of social change implicit in natural disasters and the manifest and explicit desire for change associated with civil disturbances.

Civil disturbances, unlike natural disasters, reflect, intensify and produce a basic dissensus

in the communities in which they take place. As Dynes and Quarantelli (1968) have suggested, the norms which define private property are repudiated by many involved in the disorder and the behaviors of those engaged in burning, looting and sniping can be seen as attempts to redefine the norms regulating their own communities, norms which include accessibility to the area and the ownership of property and other resources.

The normative conflict inherent in civil disturbances represents an impediment to the community's recovery, since it militates against the vast outpouring of individual and small group response from the general public. And, importantly, those officially responsible for dealing with the emergency are harassed by persons and groups in the disturbance area. Most often, the only organizations functioning in the affected sections of the community during civil disturbances are the police (Wenger, 1973) and the military and fire departments (Warheit and Waxman, 1973). To the extent there is any convergence of community personnel and material resources, it takes place outside the affected areas. This is due in large measure to the fact that an explicit danger to human life exists, and to the fact that the tasks created by the disturbance require specialized skills and in many instances a legal mandate, e.g., the suppression of fires and the arresting and legal processing of persons. The inability of many of the community's emergency-relevant organizations and emergent citizen groups to become actively involved in dealing with the crisis, accompanied by the vigorous resistance of persons and groups involved in the disturbance, leads inevitably to a dependence on extra-community resources for logistical and operational support, particularly on the part of the police and fire departments.

The varying normative contexts which constitute the operational climate within which a community's emergency sub-system functions is perhaps the most important difference between natural disasters and civil disturbances. This is true because the differing social definitions of the event evoke dissimilar community responses.

Organizational Response

Closely related to the problems associated with the differing normative contexts in which community recovery takes place is the problem of defining appropriate organizational behavior. The task of defining the collective stress situation and the response a community's emergency-relevant organizations ought to make is much simpler in natural disasters than in civil disturbances. Following the onset of a natural disaster, the community's emergency organizations and public agencies have a clear mandate: to rescue and treat the injured, locate, remove and identify the dead, aid the victims and restore the community to a state of normality as quickly as possible. There is little or no equivocation about these priorities, and confusion concerning organizational mandates during the immediate post-impact period is brief and temporary (Dynes, 1970). Such is not the case for community leaders and organizational officials confronted with a civil disturbance. For example, in riots in Los Angeles, Detroit, Cincinnati, Cleveland and elsewhere, fire officials were urged by some community leaders to become involved in crowd control. Except in rare and brief instances, however, these officials refused to arm their personnel or to use water streams against crowds, in spite of the fact that some persons in them were looting, setting fires and harassing firemen. In the civil disturbances studied, fire officials consistently refused to redefine their primary organizational goals even when such a redefinition might have lessened the demands being made on their departments. In most instances, they redefined some of their tasks, but they did so largely in an attempt to increase their organizational effectiveness; their primary organizational goals as defined by law and tradition remained unchanged: fighting fires and saving lives.

Police and other social control agencies are also faced with a number of highly ambivalent situations during civil disturbances. Probably the most difficult decision confronting them is that of defining the appropriate responses to crowd behavior. Under normal conditions, police would not hesitate to arrest or perhaps kill individuals engaged in felonious activities; this is not only within the province of their organizational domain, but is sometimes expected of them. However, when confronted with crowds of people, including women and children, engaged in a wide spectrum of illegal activities ranging from misdemeanors to felonies, it is difficult for police officials to define their appropriate responses. Does one shoot a looter regardless of the value of the property being taken; and what about arsonists? Does the age or sex of the looter make a difference? What about onlookers? What about the civil rights of those arrested? These and similar questions plagued police officials during the 1960 disturbances in American society. In the light of these problems, which for the most part grew out of the unstructured social situation created by the disturbance, governmental and other organizational officials had to come to a definition of the emergency situation which would enable police and other social control forces to restore order. The declaration of a state of emergency and the establishment of a curfew became the techniques of definition. Once put into effect, these mechanisms clearly delineated the boundaries of behavior for both social control agencies and citizens: anyone on the streets during certain hours would be subject to legal sanctions including arrest, and under certain circumstances would be liable to be shot.

The Watts disturbance of 1965 and the Detroit disturbance of 1967 illustrate this fact. The Watts disturbance began on Wednesday evening, August 11; it varied in intensity throughout Thursday and Friday, August 12 and 13. No deaths occurred among the civil population during these two full days. At 5.00 p.m. on Friday, August 13, a state of emergency was declared, and at 7.00 p.m. the first citizen was shot and killed; two more were killed between 7.00 p.m. and midnight; and from 12 midnight until 7.00 a.m. the next morning (Saturday the 14th), 11 more citizens were killed by social control personnel. The number of persons wounded during this period also increased sharply. In Detroit, the pattern was the same but much more abbreviated. The disturbance began at 5.20 a.m. on July 23, 1967. The looting and burning continued unabated throughout the day as officials from every level of government debated the steps to be taken. At 7.45 p.m. a curfew was declared in effect, and at 9.15 p.m. the first "looter" was reported shot and killed (Warheit, 1968). The declaration of an emergency and the imposition of a curfew proved to be effective instruments for social control, a fact which can be attested to by the immediacy and frequency with which they have been used since the early disturbances.

The Evaluative Response

In both natural disasters and civil disturbances there is a period after the crisis had passed when community officials, high-ranking officers in emergency organizations and public citizens evaluate the causes and extent of the emergency, as well as the performance of those organizations charged with the responsibility of dealing with it. This period is marked by the assigning of blame and praise and by efforts on the part of public officials and organizational personnel to justify their actions or inaction. For example, the civil disorders studied were so traumatic for the nation at large that a Presidential Commission was established to answer three basic questions: what happened? why did it happen? what can be done to prevent it from occurring again? (See Kerner, 1968.) Even in earlier riots in American society, such as in Chicago in 1919 and in Detroit in 1943, there had been post-event governmental evaluations of the happenings.

In the instance of natural disasters, the response is less likely to take such public and visible form. Nevertheless, emergency organizations very frequently undertake post-disaster critiques of their operations and community disaster plans are often reexamined after the crisis is over. Following some major disasters, the functional equivalent of a Presidential Riot Commission may be established. Thus, there were extensive congressional hearings in the aftermaths of Hurricane Camille and the Wilkes Barre Flood, and a massive federal research effort after the Alaskan earthquake.

However, in the longer run there are differences in the aftermaths of civil disturbances and natural disasters. In the case of riots, one often sees the beginning of long-term efforts to prevent, insofar as is possible, a recurrence of the collective stress situation and/or its adverse effects. Frequently, planning meetings are held to which representatives from the community's emergency-relevant organizations are invited. New plans are often made, tasks assigned and resources allocated on the basis of immediate past demands, organizational problems and possible future demands. At times a new community emergency synthesis occurs as the community's governmental agencies and emergency-relevant organizations attempt to restructure their resources and relationships, so as to make them more effective in the event of new emergency demands. Some of these plans are codified into laws; some become formal contractual relationships, while others remain informal, nonbinding agreements.

Both types of collective stress situations discussed in this paper evoke responses which call for the developing or strengthening of emergency plans. Most often, however, in the long run of natural disasters there tends to be more talk than action. And, at the organizational level, relatively few changes are initiated as a result of the experience of a disaster (see Anderson, 1969; Blanshan, 1975). This resistance to change is undoubtedly related to the boundary and domain maintenance activities associated with organizational behavior. Radical changes of a long-term nature in the intraorganizational and interorganizational structures of agencies involved in responding to collective stress situations are rare. Organizations have a life of their own; the perpetuation of that life is one of their major ongoing functions; and permanent alterations in their structures, even following periods of extreme demand and crisis, are the exception, not the rule.

CONCLUSION

On the basis of our analysis, it is possible to conclude that differing types of stressful agents produce contrasting kinds of community responses. Moreover, these differential responses can be attributed to the characteristics of the events, i.e., the amount of warning given, their scope and duration, and to the normative context produced by the emergency. Although these differences exist, there are also some similarities present in both types of collective stress situations. Both elicit organized community responses, that is, vigorous efforts are made to restore the community as quickly as possible to some semblance of its pre-crisis state and a period of assessment follows the emergency at which time an evaluation is made of what was done during the crisis.

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COMMUNITY CONFLICT: ITS ABSENCE AND ITS PRESENCE IN NATURAL DISASTERS*

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INTRODUCTION

"It was the best of times, it was the worst of times. It was the age of Wisdom, it was the age of Foolishness. It was the Spring of Hope, it was the Winter of Despair." This, of course, is the famous opening passage from Charles Dickens' *A Tale of Two Cities* (1946) that deals with the French Revolution. The balancing phrases capture well the dual theme that both literary writers and scholars assert characterizes personal and group behavior at times of great social stress.

That community-wide stress brings out both the "good" and "bad" in humans, that it evokes "positive" and "negative" features in group responses is an old theme in human history. Literary writers – be it Boccaccio writing on the 14th century plague in Florence, Defoe or Chaucer writing on similar catastrophes in England – have frequently and graphically depicted the dual nature of the response. In a more scholarly way, the same pattern is depicted by the ancient Greek historians, Thucydides and Herodotus, and much more recently by the British historians Teggart (1941) and Toynbee (1947).

Among sociologists, Sorokin is the one that has most explicitly stated the dualistic nature of the response at the time of great stress. In one of his lesser known works, *Man and Society in Calamity* (1942: 227), he observes that catastrophes evoke "saints" and "sinners" insofar as human and group behavior is concerned. Sorokin notes that calamities produce polarizations in effects, with individuals and societies reacting in diverse ways: "Some become brutalized, others intensely socialized. Some disintegrate – morally, mentally, and biologically; others are steeled into an unbreakable unity. In adversity some lose their sense of honor; others are ethically and spiritually reinforced . . . This diversification and polarization of effects upon the mentality and conduct of various units of the population, as well as upon sundry fields of culture, manifests itself in practically any calamity" (1942: 159).

Stated in such general terms, what the writers of fiction and what the social scholars depict is a commonplace observation and almost certainly true as a general statement. We need no further illustration of the possible dualistic response to sudden, severe stress. While the frequency and intensity of the phenomenon may still be a problematical issue, its existence as such seems beyond ques-

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tion. Instead, what is required is a specification of which response occurs under which conditions. When will human beings be "saints" and when "sinners", when will groups engage in cooperative and altruistic efforts and when will they be rent by dissension and conflict? Relatively few sociologists have addressed themselves to this problem. The two major exceptions, Fritz (1961) and Barton (1970), have been severely handicapped in their analyses since for the most part they have had to depend on secondary analysis of relatively few cases.

Recent research at the Disaster Research Center (DRC) at The Ohio State University has allowed a sharper focus on the problem. Field studies have been conducted of over 100 different natural disaster situations (for summaries of some studies, see Quarantelli and Dynes, 1970a). While our research has not been directed primarily to the problem involved, nevertheless the data gathered permit us to specify more clearly the conditions under which conflict and the conditions under which cooperation emerge at times of major emergency. We have first-hand data on many cases, allowing us to make a more intensive analysis than earlier students of these problems were able to do [1].

The research focus of the center has been on the urban community and the major organizations and groups likely to be involved in the collective response to a large-scale disaster. Not only has the immediate emergency period been examined, but some attention has also been given to longer-run responses during the relief and rehabilitation periods in the aftermath of disasters. Thus, we have been in a position to observe both short-run and long-run community conflict and cooperation in such stress situations.

SOME GENERAL OBSERVATIONS

There are three general observations that we can make on the basis of our studies. (1) There is considerable variation in the presence or absence of community conflict following a natural disaster. (2) To the extent that there is any pattern, it is one of relative absence of conflict in the emergency period and its relative presence in the post-emergency period. (3) The presence or absence of conflict is functional or dysfunctional depending upon a series of other conditions. Let us examine these observations in more detail.

Common sense would seem to argue that severe stress situations should, if not create conflict, at least amplify existing social cleavages within a community. Several logical although not necessarily empirically valid reasons might be advanced for such a supposition. Given the sudden destruction of existing resources which occurs in a disaster, the competition for scarce resources might seem to move normal competition towards more open conflict. A caricature of this is the primarily literary fiction of victims fighting over food [2]. Often, too, there exist opportunities for the assessment of blame of some kind in many severe crisis situations, thus creating or magnifying the social division involved in any sort of scapegoating process. Here the caricature is of mob action against officials seen as incompetent in carrying out their community duties in the emergency. Then, too, the fluidity of most disaster emergencies would seem to lend itself to different kinds of opportunism and selfishness. The caricature image here is that of Mr. Hyde taking over from Dr. Jekyll when social control is less possible.

Whatever the logic of this position, the empirical evidence suggests a somewhat more complicated picture, strongly correlated with time. The emergence of conflict is rather rare in the immediate emergency period following disaster impact, nor are there many indications that social cleavages which existed prior to the event are amplified during that time period. However, it is true that if there is a pattern, it reflects the absence of conflict in the emergency period and its presence in the post-

emergency period. This in fact appears to be the most likely sequence following any major community disaster.

This does not mean that there is perfect harmony in a community during the emergency period and open warfare during the post-emergency period. The degree of community conflict present is always a relative matter. It is relative to the degree of conflict present both in the pre-disaster community situation, and that present in the emergency period; there is more relative to both in the post-emergency period. Thus, when we speak of presence or absence of community conflict in disasters, the prefatory term "relative" should always be understood as being implied.

Furthermore, exceptions to the pattern of "little early" and "much later" community conflict in disasters can be found. Strong disagreement, if not conflict, appeared very early in some of the Gulf Coast communities of Mississippi after Hurricane Camille struck the area. Neither is it true that community conflict always appears in the longer-run time period when relief and rehabilitation is being undertaken, rather than just emergency response. But such instances are rare, and they are explainable in terms of certain pre-disaster social conditions. The general proposition stated above is generally true.

One reason we suspect that community conflict is expected more than is actually the case and is more noticed [3] when it does occur in disasters is because it is generally seen as being inappropriate in an emergency situation. In layman's terms it is viewed as "bad", or if we conceptualize it in the sociological vocabulary, conflict is seen as dysfunctional for the maintenance or survival of the social system in which it occurs. Certainly at a common sense level, conflict would not seem to make for efficiency and effectiveness in community disaster responses.

However, is this really necessarily the case? Is conflict always dysfunctional? Sociologists such as Simmel (1955), Coser (1956), and Oberschall (1973) have pointed out in detail some of the functional consequences of conflict in different areas of social life. We suggest and will try to illustrate briefly later on that community conflict in disasters is also not always dysfunctional. In more general terms, there is nothing inherently "good" about the absence of conflict, or inherently "bad" about its presence in post-disaster situations.

FACTORS ASSOCIATED WITH THE ABSENCE OF CONFLICT

There are at least seven factors that are associated with the absence of community conflict in a natural disaster situation. These, of course, can and do differ both quantitatively and qualitatively in any given crisis, and can reinforce one another in very complex ways. For analytical purposes, however, we will discuss each factor separately and as if each operates in isolation from all others.

1. Natural disasters involve an external threat. The disaster agent comes from outside the community system. Many other stress-producing agents do not, as for example in the case of civil disturbances, mass purges, or drastic currency devaluation. Members of the larger community or its organizational components are usually the sources of such crises and are accordingly foci for possible conflicts. But since disasters come from outside the community system, they do not lend themselves as readily to amplifying existing community cleavages or creating new internal conflicts.

Furthermore, as sociologists have long noted, one way to create solidarity within a social system is to face that system with an attack from the outside. In a sense, a natural disaster agent is an attacker from outside the system. In fact, disaster victims not infrequently personalize disaster agents so that they are talked about almost as if human agents were attacking the community. Such kinds of external threats mute existing con-

flicts and discourage the emergence of overt differences.

2. In almost all natural disaster situations, the disaster agent can generally be perceived and specified. It is the wind and funnel associated with a tornado cloud, the land movements associated with an earthquake, the rain associated with a hurricane, etc. There is something which can be seen and to which labels can be attached. Many other types of community crises are situations where it is not easy to isolate and to identify the agent involved. To some extent, certain currently popular environmental problems fall into this ambiguous category.

The importance of this general point, for our purposes, is that an identifiable threat makes it easier to mobilize for action. It provides a focus and a point around which a coordinated response can be made. Vague sources of crisis, because of their very ambiguity, leave unclear the course of action to be followed for resolution; in fact, they tend to suggest alternative responses, thus allowing community polarization around different possibilities. The myriad suggestions advanced on how to deal with campus disturbances is a recent case in point.

3. There is high consensus on priorities in natural disaster situations. In general, it is not only relatively clear what should be done, but more important, in what rough order crisis-related activities should be carried out. Yutzy (1969), in an analysis of this problem has in fact detailed the general priorities attached by communities to their emergency responses. As might be expected, the saving of lives takes precedence over anything else.

Thus the development of an emergency or disaster consensus places high priority on the activities which benefit the "total" community and low priority to segmental "selfish" interests. Considerable social pressure exists to avoid actions which can become sources of social division. This contrasts with other community crises, such as civil disturbances, which are manifestations of open conflict between different parties in the locality (see Quarantelli and Dynes, 1970b). Such crises exhibit the very lack of consensus on community priorities that shows itself in natural disaster situations.

4. Natural disasters almost by definition create community-wide problems that need to be quickly solved. The problems created by disaster agents are often immediate and imperative – e.g., rescue, debris clearance, medical care, food, and shelter, etc. – and the reasons why solutions are necessary are fairly apparent. The very existence of community life presupposes a minimal handling of such problems. In many other community crises, individuals and groups will often have not only different and conflicting definitions of the nature of the problems but also of the reasons why they should be solved.

When problems are immediate and imperative, there is less likely to be conflict in solving them. This is especially true if, as in disaster situations, the necessary solutions are relatively apparent to all. In other types of crisis situations the community can often afford the luxury of "waiting for another day", and arguing about possible solutions particularly if these are not obvious to all.

5. Disasters lead to a focusing of attention on the present. At least in the emergency period, the past and the future are temporarily laid aside. In this respect a disaster provides a degree of liberation from many everyday concerns, which does not always occur in other kinds of large-scale stress situations.

During normal times in a community, people are preoccupied with the past and the future, as well as with the present. They worry about past conflicts with others and their future ability to meet responsibilities and goals which might be a source of disagreement with others. A disaster, however, produces a present

orientation which minimizes previous memories of and future possibilities for conflict. Worries about the past and the future are unrealistic in comparison to the realities of the moment. People thus concentrate attention on the immediate day-to-day, if not hour-to-hour needs. In a disaster situation, this perspective speeds up the decision-making processes and provides a degree of satisfaction in acting directly and seeing accomplishments quickly. In general, cooperation rather than conflict is encouraged by a present time focus.

6. There is a leveling of social distinctions in disaster situations. Whereas many stress situations accentuate status and other differences, natural disasters democratize social life. Existing social distinctions are minimized in the emergency period of disasters in the sense that all groups and statuses within the community may be indiscriminately affected. Since the threat comes from "outside" and affects "all" community members, this produces a temporary breakdown in class, ethnic, and other status distinctions. A general democratization of social life is further facilitated by the fact that danger, loss, and suffering become a public phenomenon.

In other crises, people can often point out discriminating injustices. Even in most accidents or personal life crises, the victim often feels discriminated against since there are others who have been spared. And the necessity to explain why a particular person or category of individuals has been singled out for special punishment or suffering can heighten existing community cleavages. In general, community stress situations not accompanied by social leveling are likely to lead to conflict; natural disaster situations usually provide just the opposite context.

7. Disasters strengthen community identification. They do this (a) creating a dramatic event in the life history of the community; and (b) allowing wide opportunities for participation in community-relevant activities.

(a) Disasters have been compared to a drama which facilitates group identification by gripping people's imagination and heightening the sense of importance of collective human action. This is a very valid observation. Disasters do not involve mundane matters, but often the very issue of human life itself. In addition, the drama is not played out in private and with only a few participants. A disaster is a public event widely shared by community members. Furthermore, many initial emergency reactions are at the level of human beings responding to one another as human beings. For example, while initially there is considerable anxiety about the welfare of family members and other relatives, much rescue activity is directed toward those whose social tie is simply that of being another human being in trouble.

As a consequence, all those who share in the experience are brought together in a very powerful psychological sense by their common participation in such a dramatic event. To victims, the disaster is "our" disaster, an experience that is important in the collective memories of the affected community almost as soon as impact is over. While some other community crisis events may be equally as dramatic, few can match disasters in highlighting the sense of having undergone a common and a very human experience.

(b) Disasters also provide very wide opportunities for participation in activities for the "good" of the community. After initial rescue activities, there are subsequent opportunities for participation in community activities, either as a volunteer or as an organizational member. Such activities are centered on emergency tasks created by the disaster, so that many of the elements of community conflict which exist prior to the event are no longer relevant. In contrast, pre-impact, day-to-day activities are often carried out in conditions of opposing community interests and in situations which often engender hostility rather than cooperation.

Participation in disaster activities is also frequently undertaken in social contexts that give a person great latitude or choice in the determination of what and how certain things should be done. Earlier rules which might have been felt as restrictive, previous procedures which encouraged routine, as well as standardized situations which make for repetition, tend to disappear. The emphasis is on adaptation and innovation. But others with whom the person is involved are faced with not different but similar situations, so interests become common rather than conflicting. Also, the individual efforts are relatively easy to evaluate and therefore a person can easily see his own contribution to the "good" of the community. This, in turn, strengthens his own identification with the community. That person has become a contributing member – a person with something to offer who can now show concrete and positive accomplishments.

FUNCTIONAL AND DYSFUNCTIONAL ASPECTS

While such enhancement of community morale has obvious positive consequences, there is another side of the coin which tends to complicate the communities' relationships with "outside" help and with extra-community organizations. The increase in solidarity within the community is accompanied by an increase in hostility towards outsiders. This is true even when those outsiders come to give aid. This reduced tolerance has certain distinctive features. First, it does not apply to all who are outsiders in a geographical sense, since in particular situations members of organizations that are not locally based are welcomed. Second, the determination of "who" is an outsider is not necessarily related to whether the individual is performing a useful function during the emergency period. Personnel from organizations who play critical roles in the emergency period are often the target of direct hostility. In effect, the determination of "who" is an outsider seems to be based primarily on giving the appearance that they share the sentiments of the insiders. For example, the Salvation Army workers who seem to express sympathy and share the "feelings" of local community victims are often considered insiders while other welfare workers, such as Red Cross personnel, who maintain a more professional stance, are often considered outsiders (Stoddard, 1969; Adams, 1970).

The dimensions just mentioned – external threat and identifiable danger, the development of an emergency consensus, the facing of immediate problems, a present orientation, the leveling of social distinctions, the expansion of opportunities for participation, the strengthening of community identity, and the generation of hostility towards outsiders – have been sometimes conceptualized in the disaster literature as creating a "therapeutic community" (Fritz, 1961: 684). This seems a useful way of thinking about the phenomena. The process *is* therapeutic at both the individual and social level both in its nature and in its effect, in the sense that it:

1. Tends to resolve and ameliorate pre-existing personal and social conflicts that could endanger the continuity of social life.
2. Tends to attenuate or prevent disorganizing individual and social responses which could emerge in conditions of danger, loss and deprivation.
3. Tends to reduce or prevent self-aggressive and anti-social behavior arising from the losses imposed by the disaster.
4. Tends to remotivate individuals within the community system to devote their energies to socially constructive and regenerative tasks.

There is another aspect of the function of this "therapeutic" community which is of particular importance in reference to the subsequent patterns of community organizations. Turner (1967) has suggested that some degree of consensus on values within a community is

necessary in order that an effective division of labor develops and carries out the tasks created by the impact. Upon impact, the existing division of labor within the community becomes less effective, since it cannot handle many of the new tasks created. But prior to the development of a new and more effective division of labor within the community, agreement on priorities has to be reached. This consensus, then, is necessary for the re-establishment of the division of labor.

Turner has also suggested that the enactment of solidarity within the community during the emergency period is necessary since each person in the developing division of labor must neglect other essential tasks in order to perform new tasks. Consequently, there is need of assurance that the neglected tasks will be performed by others. The enactment of solidarity during the emergency period reaffirms the importance of individual community members' contributions to the total group effort and, in turn, motivates them to contribute. Thus, a period of enactment of community consensus is necessary to recreate the continued assurance of agreement on the priority of values. Once this assurance is "given", then a new division of labor can emerge. Until this assurance is "given", the adaptations necessary, in the form of a new and appropriate division of labor, will not be made. In effect, we have suggested that increased solidarity within the community during the emergency phase is a necessary condition for the development of the division of labor needed to cope with the various crises. In this sense, this solidarity is "functional" during this "phase" of disaster activity.

There is, of course, no clear demarcation between the emergency and the rehabilitation period. Neither is there a standardized period which can be called the "emergency", as such. The extensiveness and severity of disaster impact are major factors which create variations on the "emergency" theme. For one community in one context, it may be 36 hours, and for another it may be four or five days. There are certain common social indicators, however, which can provide clues to a line of demarcation. These indicators point to a period of transition from the focus on immediate disaster-related problems back to a focus on long-range community problems, disaster-related or otherwise. A rather constant transitional signal is what we call "white shirt" day. One morning, spontaneously and without prior discussion, most of the individuals involved in the emergency move back to normal dress patterns. Municipal officials become "white collar" workers again. Men don suits and ties, and women reappear in skirts. This "white shirt" day tends to coincide rather closely with the re-establishment of activities considered unnecessary during the emergency period. A number of activities are re-established which were abandoned or ignored during the previous period. Schools, bill collection agencies, fur stores and movies announce that they are re-opening and ready for business.

Not all segments of the community end the emergency period at the same time, however. The police may go back to regular shifts while the municipal public works department is still working overtime. But usually within a relatively short period of time, all the signals point to a new state of "normalcy". There may still be difficulties – power failures, telephone malfunctioning, heating problems and makeshift work conditions – but these are seen as part of the game: uncomfortable, but normal. This new normalcy also provides the setting for the emergence of conflict. Certain aspects of the conflict which do emerge are traceable in part to some of the changes which have occurred during the emergency period. In other words, the solidarity which was produced during the emergency period provides part of the basis for conflict.

ASPECTS OF CONFLICT

Focusing now on this rehabilitation period, it is possible to raise a number of questions. First of all, if conflict develops, what is it about? Secondly, who becomes involved? Thirdly, what factors mute or amplify the conflict?

First of all, it is our observation that two major themes tend to become the focus of conflict during the rehabilitation process – the allocation of blame and the allocation of resources for rehabilitation. The allocation of blame is found primarily in "man-made" disasters (see Drabek and Quarantelli, 1967) but certain aspects may be found subsequent to "natural" disasters. As we indicated earlier, one of the factors minimizing conflict in natural disasters was the fact that the precipitating agent came from outside the community system. That such agents are seen as "acts of God" tends to reduce their potentiality as a source of conflict. However, there are certain aspects, even of these acts of God, which can give rise to conflict. These are most likely found in those disaster events brought about by agents which allow time for warning and consequently, for pre-impact action. Among the disaster agents normally having these characteristics are hurricanes and floods. There are three problematic aspects of such agents. (1) The correct interpretation of environmental cues has to be made – in other words, the direction and speed of the disaster agent have to be determined. (2) Warning has to be provided for those who are in the area where impact will occur. (3) Specific action such as evacuation may be required of certain segments of the population. Each of these aspects can become the focus of conflict after the emergency period and blame can be directed toward the official agency most immediately involved. In the United States, for example, the National Weather Service is primarily responsible for the interpretation of environmental cues but warnings tend to be the responsibility of various governmental agencies within the community, as are efforts to implement pre-impact preventative actions. Thus, in Wilkes-Barre after the flood, criticisms were made of the Weather Service's alleged failure to clearly indicate the danger of flooding, as well as the supposed inaction or inadequate response of civil defense and police agencies in the area.

The potentialities for blame in these situations are relatively high, primarily because organizational officials find themselves confronted with uncertain choices. The interpretation of environmental cues is usually couched in terms of probability (Simpson, 1973). Given a low probability of impact, social control and governmental officials are sometimes reluctant to warn populations because they feel that the population may "panic" (Quarantelli, 1960). Another source of reluctance is that the officials think that warnings with low probability will undermine the confidence the population has in them in future warnings in situations of higher probability (McLuckie, 1970). This is most clearly seen in the lack of legal power to enforce evacuation. (It should be noted that with experience, social control officials in areas of recurrent disaster impact often develop extra-legal methods, such as threats of arrest for other offenses, to encourage compliance with evacuation orders.)

A second major focus of conflict often centers around the allocation of resources for rehabilitation. This arises because communities are often faced with many more options than they normally would have, and they often have *in toto* more resources than they had available prior to impact. This was most apparent in the rebuilding period in many villages, towns and cities in the aftermath of the Alaskan earthquake. Previously unthought of options and massive outside assistance from state and federal agencies set the stage for bitter interorganizational disputes and community conflict. This also happened in Wilkes-Barre after the flood, and in Xenia after the tornado had struck.

What is surprising in these situations is not that conflict breaks out, but that it takes as long as it does to surface openly and that the parties involved sometimes seem taken aback by the ferocity with which the struggle is waged. The slow realization is probably related to the time it takes at the local community level to recognize that the often-massive inflow of state and federal assistance is slowing down, if not stopping. The growing awareness that the outside world is becoming less concerned with the local disaster and is unlikely to continue funnelling in resources often leads to precipitous efforts among different community organizations to "grab" whatever seems left of the declining pool of money and supplies flowing in from the outside. It would require a very unusual set of conditions not to have this kind of community conflict emerging during the rehabilitation phase of a major disaster.

Interestingly, the conflict over the allocation of resources often centers around procedural steps in obtaining available resources. This focus of conflict can be understood by looking back to the emergency period. During this period, many resources pour into the community. Fritz and Mathewson (1957) have called this "convergence behavior". Information, personnel and material goods converge in on the community. While much of this is not needed, and in fact often diverts from the more critical activities during the emergency period, it is difficult to refuse and almost impossible to control. The important point here is that resources are available and are "freely" given, with only minor questions raised about procedural niceties and organizational responsibilities. However, during the rehabilitation period these procedural niceties again become important and usually take a bureaucratic form. Questions of need, financial responsibility and intended utilization all become relevant. To members of the impacted community who have experienced the inconvenience and suffering of the emergency period, these questions seem unnecessary and irrelevant. Relief agencies which earlier were dispensing help without question now become more formal and more bureaucratic and, in the view of community members, heartless. Various government agencies ask questions which in another context would be routine, but now appear as prying. Local agencies find that state, regional and federal organizations no longer seem willing to cut the "red tape"; if anything, procedures appear to be more complicated, complex, detailed and time-consuming than seemingly similar pre-disaster activities.

The second question we posed about who gets involved in conflict is not as simple as might appear at first glance. There is a difference between individual or household disaster victims and local community organizations (at least, after a certain time period). At the individual or family level there is a great tendency for hostility to be directed toward the "outside" organizations which have continued responsibility during the rehabilitation period. In the United States, this generally means various state and federal governmental agencies and a few relief agencies with national ties. The cohesiveness which has been created within the community during the emergency period carries over and forms a "united" front. Since local residents are more likely to have direct contact with relief groups, much of the hostility is directed there. Since various community officials have more direct contact with other governmental agencies, they are more alert to problems in these areas. Criticisms of the various organizations are often expressed in local newspapers and through the emergence of informal groups of aggrieved citizens (see Forrest, 1972), some of which achieved a degree of almost national notoriety such as in the Wilkes-Barre flood and the Buffalo Creek dam disaster. The ventilation of feelings within the local community are often provided an unanticipated forum by some governmental committee, which investigates and holds hearings. While the intent of these investigations

is often to expedite aid (and sometimes to advance the political ambitions of certain committee members), they also provide a forum for complaints.

The important point here is that the emergency period produces cohesiveness which leads to conflict with "outside" agencies, which in turn leads to greater cohesiveness. Those in the impacted community always have the moral advantage since they speak from a position of suffering, and those in the outside organizations are thus placed on the defensive. This in-group–out-group feeling is also seen in another context. Considerable sums of money may be raised voluntarily for relief purposes and committees are often placed in charge of distributing these funds. In such situations, one can almost be certain that members of the local community will raise objections to the appointment of "outsiders" on such a committee. Such appointments are seen as political ones. In general, members of the local community will reject any "outside" attempt to control resources which they feel should be properly in their control.

Even in the allocation of blame, the attempt to attribute it to local officials is resisted and resented. In the event of an apparent delay in warning where Wheather Service officials may become logical targets, there is a tendency to minimize the culpability of local bureaus and to focus on higher levels of administrative authority as the source of bureaucratic inefficiency. What is true of the National Weather Service is also true of other organizations within the community which have ties to state and national jurisdiction. State and National Civil Defense may be criticized, but local CD officials are praised for their work. State and national governmental units are found fault with; but their local representatives are "excluded" from this criticism.

However, the united front of the locals (individuals and organizations) against "outsiders" eventually tends to break down as already indicated, particularly in terms of the local groups. The local community organizations can afford to cooperate with one another as long as it seems that outside groups are going to provide almost unlimited assistance. But once outside organizations start to withdraw, and indicate that their help is starting to come to an end, the stage is set for competition among local agencies. The struggle, as we have already indicated, often appears to be about procedural steps required to obtain outside resources. But the ever-increasing bureaucratic steps, of course, demand more and more explicit explanations and defenses of need, responsibility, intended utilization, etc. With clearly shrinking incoming assistance facing them, some organizations eventually reach the point of arguing that they have more need, it is their greater responsibility, or they will better utilize the possible help than some other local groups. At this point, the community conflict is often interorganizational, with the competing agencies falling back on using whatever power base and sources of influences they have in the local community. (At the individual or household level, the disaster victims even in the rehabilitation stage seem less likely to be competitive with one another, possibly because a person who has directly suffered in a disaster appears to be able to make a moral claim for help that an organization as an impersonal entity cannot make.)

Three factors seemingly tend to amplify conflict: the addition of a political, ideological or vested interest dimension. In a few instances, the in-group–out-group lines of conflict are reinforced by political dimensions [4]. For example, the local community officials may be from one political party, but state and national officials may represent another. The conflict, then, tends to take on a political tone. From the local community vantage point not only are those outside of the community causing trouble; but they are "motivated" for political as well as bureaucratic reasons. (This can also occur to some degree if the officials within the community and those outside the

community belong to different factions within the same political party.)

A second factor which serves to amplify conflict is what might be called an ideological component. This has occurred rather infrequently so far in the aftermaths of disasters in the United States. But as values change in society, there are some indications that ideological conflict may appear more often in future American disasters.

For example, there have been accusations following several recent disasters that relief and rehabilitation administration has discriminated against various disadvantaged groups such as blacks or working class segments of the population. A conspicuous example of this was the charge leveled by several national groups, such as the N.A.A.C.P. and the American Friends Service Committee, that post-disaster relief efforts in Hurricane Camille were highly discriminatory. The effect of such charges, whether warranted or not by the facts of the case, is often to amplify the in-group–out-group cleavage. The reason for this is that the accusations are likely to be made about outsiders. If these charges are believed by any segment of the local victim population, they are more likely to be believed if the complaints are about "outside" agencies. Therefore, national organizations such as the Red Cross and the Small Business Administration become the target of any local hostility that develops, while community organizations remain aloof and are protected by the reinforced cohesion of the local community.

Finally, a third factor that may operate to intensify conflict is the surfacing of vested interests. As we have discussed elsewhere (Dynes, Quarantelli and Kreps, 1972), the demands of a disaster situation frequently lead to the emergence of new local groups who attempt to cope with the increase in normal tasks as well as new tasks and requirements posed by the community emergency [5]. (In some instances, already-existing community agencies extend their activities and responsibilities into new areas.) For a while, as massive outside aid is brought into the community, there is unlikely to be much open conflict between the more established organizations and the new or extended groups in the disaster community. There is enough to do for everyone, and as already mentioned, there is usually more than enough outside help to share or to divide up in a non-competitive way.

But as the non-local aid dries up for the reasons indicated, competition will emerge between the newly-emergent and the more established organizations in the community. This competition will be particularly facilitated if the more established groups believe or perceive that their vested interests are threatened. This can easily occur if in the course of responding to the disaster, the emergent or extending groups have taken over some traditional tasks or responsibilities of established community groups. Conflict can then develop in the rehabilitation phase not only over the proper sharing of the ever-reducing flow of outside help, but also over who has the legitimate right to undertake certain tasks – the traditional established organizations or the newer groups who emerged or who extended their activities into non-traditional tasks at the time of the emergency and at the beginning of the rehabilitation phase? This kind of conflict is additionally facilitated by the disappearance of outside agencies as possible targets of attack and hostility. The inside–outside cleavage no longer helps to maintain the united front of the local community groups since in one sense, the outside organizations disappear as possible foci of attention.

CONSEQUENCES OF CONFLICT

What are the long-range consequences of conflict? We would argue that the conflict which does occur during the rehabilitation period tends to reinforce the community cohesion which is produced during the emergency period. One fear which is often expressed

by community officials early in the emergency period is that the severe blow to the community system may result in the loss of community members who might become discouraged at the complex tasks ahead. Therefore, there is a great deal of attention given in the emergency period to developing and sustaining community morale. We have suggested that the conflict that does develop during the rehabilitation period can be seen as taking an in-group–out-group form, which is both an expression of the cohesion which exists and a constant reinforcement of it.

Conflict can, of course, be dysfunctional. Political conflict may lead to cessation of outside help, although this very rarely happens in American society (although the degree and speed of assistance may be affected). The net effect of ideological conflict such as manifested in charges of unjust distribution of relief aid may, by deflecting the criticism on outside organizations, make it more difficult for them to work within a cohesive local community (although in actual fact we have not seen this on any large scale). And as already indicated, the interorganizational conflict may emerge over what are seen as important vested interests. To the extent that this occurs, it can also drain attention, energy and resources away from rebuilding the local community. In this way, the conflict could be extremely dysfunctional for the community as a whole.

Nevertheless, our impression is that such conflict may not be as important or significant as it might seem to the particular contending parties. Often the post-disaster rehabilitation conflict that emerges is little different from the pre-disaster disputes, cleavages and disagreements that prevailed in the community, although some of the clashing groups may be different. A certain degree of interorganizational conflict is a normal characteristic of everyday American community life. In a way, the reappearance of overt conflict is a sign that the disaster-impacted community has returned to "normal". It also means that the conflicts are being worked out through the usual interplay of contending parties using whatever influences and power they can call upon, be these citizen support, mass media assistance, mobilization of special interest groups; and the whole panorama of processes that Coleman (1957) notes are usually operative in standard kinds of community conflict, be they about fluoridation, urban renewal, freeways, school integration, juvenile delinquency, or what have you.

Having observed the varying degrees of conflict in communities during the aftermath of a disaster, and looking at these same communities several years later, we can draw several conclusions.

1. The major post-impact activity has typically centered on restoration. Generally, economic recovery has been relatively rapid and the initial fears of the possibilities of economic ruin have been dissipated. Whatever conflict there has been has seldom interfered much with the long-run recovery.

2. Relatively few social structural changes occur in local organizations and communities after disasters. Our longitudinal post-disaster studies of Anchorage, Indianapolis, Topeka, New Orleans and Wilkes-Barre after they underwent major disasters uncovered relatively few changes in organizational structures and in such functional matters as disaster planning. Most of the changes that occurred were in the acquisition of additional resources (see Anderson, 1969, and Weller, 1973). The relative lack of this kind of change did not seem to be associated with community conflict.

3. The changes that did occur were primarily in the direction of continuing pre-disaster trends. The rehabilitation period conflicts, no matter how argued, seldom bring about drastic changes. The community is not quite the same after a major disaster, but then it is not really that different in most cases. Existing trends

are speeded up by a disaster, so if some organizational changes and modifications were under way, the disaster has usually served to accelerate their coming into being (see Blanshan, 1975).

4. A high level of morale is left in these communities as a result of their experience during the emergency and rehabilitation phases. The event itself has become part of the community history, and has taken on an important symbolic meaning. The disaster event is now used to demark time and to differentiate phases in the life of the community. Intense pride is evidenced in interpersonal relationships by recalling the role each member played in the emergency and the rehabilitation process. This high morale is also intensified by the recollection of the difficulties the local community had to contend with, not only from natural forces, but from "outside" groups. There is a residue left from interorganizational and community conflicts, but it appears to be relatively insignificant compared with the high morale generated from having overcome extra-community hostile elements, natural or human.

One final note is perhaps necessary here. While the earlier observation of the lack of community conflict during the emergency period is derived from observations on disasters in American society, we feel that it would have generalizability cross-culturally, since it is based on a common reaction to crises. However, the nature of conflict which emerges during the rehabilitation period would show a great deal of variation cross-culturally. Perhaps the major variable conditioning such conflict would be the relative involvement of different governmental and non-governmental organizations in various phases of disaster activity. In the United States, responsibility for disaster activities is generally located at the level of the local community. This results in conflict between the local community and outside agencies. This particular structuring is somewhat unique. In most other countries, the national government has much more responsibility, supplanting both local and non-local private agency responsibility in times of disaster. Because of this heightened national involvement, conflict during the rehabilitation period is much more likely to take on a national political dimension. The party in power is held responsible and opposition parties tend to use a disaster incident as an opportunity to assess blame (see Quarantelli, 1963). In some cases the heavy use of military units in these societies may mitigate this political dimension, since the military is sometimes able to maintain a position of neutrality. Perhaps the key dimension here is the notion that conflict follows responsibility. In the local American community, responsibility and involvement result in cohesiveness which is generally functional in the rehabilitation process, but also contributes to the focus and direction of conflict that does appear.

Finally, the similarity of community conflict to conflict in other than natural disasters is something that is of importance. Some of our observations, as already noted, are quite similar to those of Coleman, for example, in his book on community conflict which deals with other than major community crises (1957). Thus, the study of community conflict in natural disasters and the stress involved, should be seen as a means of studying in clearer fashion a social phenomenon which is an integral part of everyday life (see Smith, 1971).

NOTES

1. Examples and illustrations otherwise not referenced in this article are taken from unpublished data in the DRC files.
2. In extremely rare instances in disasters outside the western world, isolated instances of such behavior have occurred.
3. The noting of conflict is also common among journalists, who will elaborate on the drama inherent in conflict, but ignore the more harmonious situations. See Waxman, 1973, for an account of radio and television station reports during disasters.
4. For a discussion of the political aspects of disaster situations, see Brown and Goldin, 1973: 66–105.
5. A theoretical discussion of emergent groups is presented in Weller and Quarantelli, 1973.

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INCENDIARISM: AN OVERVIEW AND AN APPRAISAL

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SUMMARY

This report [1] summarizes the conclusions reached by members of the Committee on Fire Research of the Commission on Sociotechnical Systems, National Research Council and by experts in the field of arson and incendiarism who were in attendance at a Conference on Arson and Incendiarism, held at the National Academy of Sciences on July 29–30, 1975. It was the firm conclusion of the Committee on Fire Research that a symposium on incendiarism should be held within the next 10 to 12 months at the National Academy of Sciences. The symposium should: (1) review the state of the art of detection, investigation, and prevention of incendiarism; (2) stress the pursuit of knowledge in areas singled out in this report as deficient; (3) review action programs in related areas; and (4) emphasize behavioral interfaces with other segments of the problem.

Background

Long a subject of concern to the fire community in general and to the Committee on Fire Research in particular [2], incendiarism (especially its most visible manifestation – arson) has proved intractable as a study topic and unwieldy as a focus for interdisciplinary examination. Uninformed though we might feel regarding some aspects of combustion, of fire development, and even of fire suppression, we are by contrast almost illiterate regarding most important facets of incendiarism, and simply ignorant as to most behavioral factors. Statistics are at best conflicting; ar worst they are false if not falsified. Jurisdictional disputes are the rule, and even innocuous speculation (much less the making of pronouncements) is shunned by the medical profession. While investigative methodology is making some progress, most other areas are not. As a result, the proliferating arson-oriented meetings tend to involve the same people saying the same things to each other. Pursuit of the "why?" of the problem continues to languish.

Hence this attempt to bring together the three major professions in the field – behavioral (medical), suppression (fire chiefs), and criminological (arson investigators). It is time to ask ourselves whether or not we really understand anything about arson and incendiarism. Can we get quantitative about it, or can we just continue to be descriptive? What are the stumbling blocks of fire suppression people and of arson investigators and of behavioral people? Are the data good or bad, and is there any hope for upgrading? Are the data really

*The author served as Chairman of the National Academy of Sciences Conference on Arson and Incendiarism, held July 29–30, 1975 at Washington, D.C. Members of the committee and conference participants are listed at the end of the summary report.

slanted as by calling arson deaths something other than murder? Who should be trained to do what and how?

Finally, as we explored the problem areas we concluded that, while a small gathering to assess the situation was necessary, timely, and feasible, we could not be certain that a major National Academy of Sciences symposium on the subject was to be viewed so sanguinely. Hence, the second and practical question: should we recommend a major symposium and, if so, when, where, and of what scope?

Findings

As a result of some 17 hours of discussion within the span of only 28 hours, a number of responses to the foregoing can be formulated. The following pages reflect the papers, the comments, and the debates [3, 4]. The general statements enjoy broad if not fully unanimous support; some of the more detailed remarks juxtapose several -- at times divergent – points of view.

Perception of "incendiarism" by various groups and subgroups of people covers an almost incredibly wide range. Webster simply equates it with "arson," whereas others broaden it to include innocent playing with matches. It would seem appropriate, therefore, to promulgate an agreed-upon definition or series of definitions in order to facilitate unambiguous communication and then to form action programs appropriately. In this paper we use "incendiarism" in the broadest possible sense and restrict "arson" to the classical usage of setting fires for gain or malice.

This lack of focus tends to obscure the true or perceivable cost of incendiarism, because the attribution of origin of fire events is ambiguous. There rarely surfaces in the awareness of the public the fact that a vast number of fires go listed as "of undetermined origin" or, worse yet, "unknown." Terminology itself is a stumbling block, but even conservatively lumping together arson, potential arson, probable incendiarism, and fires of undetermined origin, we can come up with a total of about half the fires in the United States, for a total damage of 5 to 6 billion dollars per year. This total, which seems valid as a general summation although not subject to strict audit at the moment, would make incendiarism (certainly) or arson (very probably) the single largest source of unwanted fires in the United States or perhaps in the world. This fact, too, is obscured in the public view by the more customary quotation of the figure for "definitely arson" losses; itself a large and provocative total, it still is not so gripping a statistic as the likely 50 percent just cited. By whatever yardstick, arson is on the upswing; yet public awareness of arson is low, and public motivation to reduce the total is even lower.

Apathy is not the precise term to describe this attitude, if we are to believe the polls conducted on similar topics. Nobody is really unconcerned about arson; they all agree that it is a problem that needs work. They just believe somebody else is working on it.

Within the public safety community (police, fire, and related programs) there is again a considerable variation of points of view. Law enforcement officials at all levels seem prone to regard arson as the fire departments' problem. Ambivalence in the fire service itself has not helped clear this up. Among others, the motives for passing the buck include the desire to have better statistics (and hence public image) about one's own group, the need to cut budgets, and the desire to avoid tackling a messy problem. Listing of major crimes by the Federal Bureau of Investigation does not include all felonies in the mandatory section of the statistics program; hence arson (a felony) and arson-related fire deaths (murder) do not necessarily reflect poorly on either group. Such shirking of responsibility does not contribute to the solution. We note that the most classically, unequivocally heinous crimes – arson and treason – receive scant attention by data people.

It is in the budgetary field that reduction of

incendiarism can run into problems within the fire community itself. Most major fire department budgets are controlled by the fire suppression forces. Manpower costs are likely to run to 90 percent of such budgets, and when decisions are made on additional hardware and reduced manpower, arson bureaus are frequent victims. In various cases cited, there has been total uniformity as to consequence: reduce arson investigators and investigations and watch arson increase at once.

Facilitation of investigation of the source or origin of a given fire is an inhibition on optimal suppression of going fires. The reflex of the first firefighters on the scene is to put out the fire, not to preserve evidence. We cannot urge firefighters to ignore threats to life, or likely fire expansion, but it would appear that modification of procedures (and of relevant training) would be in order.

The role of fire prevention in reduction of incendiarism appears to be largely in the educational field, with the general public and particularly with juveniles. Our culture tends to make fire in general attractive, whether it be blowing out the birthday candles or helping Daddy start the barbecue, not to mention spectator events such as bonfires, rallies, pyrotechnics, or running fire apparatus. Respect for fire and its potential is an often neglected educational topic.

Fire marshals in many cities and states are charged with both prevention and investigation; in many cases they report to the fire chief, who tends to be oriented toward fire suppression. Even when this is not the case, the dichotomy risks being dysfunctional. However set up, the marshal tends to concentrate on arson investigation, and it is here that the system has the greatest potential for failure. Conflicting laws and division of responsibility, coupled with manpower and operating budget cuts, can lead to drastic neglect of the crime of arson, of its investigation and prevention, and of the public measures required to cope with it.

Investigation of the origin of fires is a basic requirement. In some large cities such checks are routine; in rural areas, particularly those served by suppression-oriented volunteers, arson investigation devolves onto state-level authorities, meaning usually too little and too late. In every case cited, vigorous and consistent investigations led to reduced incidence of arson, whereas reduction of the investigative staff was followed by an increase in arson-attributable loss.

Insurance-supported arson investigators functioned well, but that structure has long since been disestablished. Some insurance-sponsored work continues, but it appears that only publicly funded programs can develop major impact from now on. A full systems analysis relating loss, suppression, and investigation costs and other important factors is urgently needed if prevention and control of incendiarism is to progress. There are perhaps 6,000 arson investigators in the United States today; how many is "enough," and how should they be used?

From the point of view of the medical profession, incendiarism is perhaps less structured overall, although more minutely described. Hospitals suffer from the same problem as do fire suppression forces: arson calls reduce availability of forces and delay responses. They also need to foresee and cope with internal arson and carelessness and childish (or senile) acts.

Behavioral aspects, however, take the lead in demanding medical attention to incendiarism. An extremely broad grouping of people who light fires or cause them to be lit are generally accepted as being motivated at least in part by emotional problems or mental deficiencies. The general state of knowledge in such matters is relatively undeveloped. Research has not had the benefit of large samples, and virtually all of the samples studied have been selective; that is, the patients or inmates were already diagnosed as "arsonists," or some related term has been used. There is thus a presenting need to explore the social, cultural, demographic, value-judgment, and attitudinal profiles of people in-

volved with set fires and the epidemiology of the acts. A major problem impeding communication among researchers is taxonomy; even the structures partly accepted so far do not cover such obvious cases as the person who hires the actual arsonist. There is still disagreement over whether or not an incendiarist is in some way "sick." For many, setting fires is a final-type action, not a means to an end; for others, it is quite obviously a part of movement toward a goal. For some, punishment or its threat is a deterrent; for others, the "reward" of a successful fire-setting may be enough to tend toward terminating such conduct.

Consensus on Findings

Within the formulation in the foregoing paragraphs, we find a consensus in the following areas:

Data:
- Terminology is not uniform.
- Collection forms and practice are not coordinated.
- Collation is rudimentary.
- Interpretation is subject to question.
- Dissemination is unstructured.

Training:
- Content of training material is reasonably understood.
- Need for training is not fully documented.
- Levels of need are widely accepted.
- Funding of training programs is spotty.

Laboratories:
- Crime laboratories are overworked.
- Arson laboratories could fill some gaps.
- Gaps are not yet documented.

Staffing:
- Arson investigators are needed at all levels.
- Optimum numbers have not been defined.
- Relationships between investigators and other public safety people are not well defined.
- Where staffing declines, arson increases.
- Where investigation (leading to indictments, arrests, trials, and some convictions) rises, arson declines.

Research:
- The great void is in the behavioral area. A full-level professional systems analysis (including cost–benefit study) is sorely needed, in order to eliminate undesirable intuitive judgmental factors.

Major *disagreement* persists as to these points:
- Delivery of arson investigation services outside major municipal environments – how and who.
- Police and fire department boundaries in incendiarism affairs.
- Mental "sickness" matters as related to incendiarism, as a decision point.
- The overall action program mandated by our understanding of the problem and the conflicting performances of major actors in the system.

An Incendiarism Symposium in 1976?

Responses of the conferees to the direct "yes or no" question of holding a symposium ranged from "yes" to "no", with a strong showing of "maybe's" in the center or more likely on the edges. Negative voices stressed the point that the state of the art is well exposed to technical people in numerous events, such as classes for arson investigators. They felt that another introspective gathering would be pointless.

On the other hand, many people who are uneasy about lack of structuring of the problem and of research in the area of incendiarism felt that a major symposium under prestigious aegis could only serve for good.

Qualified observations stressed the need for continuity (periodic discipline-oriented conferences), analysis (small problem-oriented study groups), and relevance to actions inside and outside the incendiarism area (new federal

agency programs in fire and law enforcement, for example). Some uncertainty as to the role and mission of the National Academy of Sciences in technical areas was also evident among invited participants.

It is the firm conclusion of the Committee on Fire Research that the very uncertainties cited serve to underscore the need for a properly pitched conference on incendiarism within the next 10 to 12 months at the National Academy of Sciences in Washington. That symposium should:

- Review the state of the art of detection, investigation, and prevention of incendiarism in a depth not attainable in our one and a half-hour sessions per discipline;
- Review action programs in related areas;
- Stress pursuit of knowledge in areas singled out here as deficient; and
- Emphasize behavioral interfaces with other segments of the problem.

Funding, staffing, and solicitation of participation should be undertaken at once by the National Academy of Sciences, using the Committee on Fire Research as a pivotal executive but non-exclusive group.

NOTES

1 The project that is the subject of this report was approved by the Governing Board of the National Research Council, whose members are drawn from the councils of the National Academy of Sciences, the National Academy of Engineering, and the Institute of Medicine. The members of the committee responsible for the report were chosen for their special competences and with regard for appropriate balance.

This report has been reviewed by a group other than the author, according to procedures approved by a Report Review Committee consisting of members of the National Academy of Sciences, the National Academy of Engineering, and the Institute of Medicine.

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The National Research Council was established in 1916 by the National Academy of Sciences to associate the broad community of science and technology with the Academy's purposes of furthering knowledge and of advising the federal government. The Council operates in accordance with general policies determined by the Academy by authority of its Congressional Charter of 1863, which establishes the Academy as a private, non-profitmaking, self-governing membership corporation. Administered jointly by the National Academy of Sciences, the National Academy of Engineering, and the Institute of Medicine (all three of which operate under the charter of the National Academy of Sciences), the Council is their principal agency for the conduct of their services to the government, the public, and the scientific and engineering communities.

2 The Academy's Committee on Fire Research, with Dr. Nelson T. Grisamore as its Executive Secretary, consists of Carl W. Walters, M.D., Harvard Medical School (Committee Chairman), J.S. Barrows, Colorado State University, Dr. William J. Christian, Underwriters Laboratories, Inc., Professor Irving N. Einhorn, University of Utah, Dr. Robert M. Fristrim, Applied Physics Laboratory, Dr. Leonard Marks, University of Maryland (conference co-chairman), Dr. Ann W. Phillips, Smoke, Fire and Burn Foundation, Gordon W. Shorter, National Research Council of Canada, Richard E. Stevens, National Fire Protection Association, and James W. Kerr, Defense Civil Preparedness Agency (Liaison members of the committee and conference chairman).

3 Conference speakers in the *Fire Chiefs' Panel* included Chief E. Stanley Hawkins, Tulsa, Oklahoma (Panel Chairman), and panelists Dan J. Carpenter, Fire Administrator and Chief Fire Marshal, Charlotte, North Carolina, and Alcus Greer, Assistant Chief and Fire Marshal, Houston, Texas.

The *Behavioral Panel* was chaired by Dr. Walter Moretz, George Mason University with Dr. Nils Wiklund of Lund, Sweden serving as panelist.

John E. Struerwald, St. Peters, Missouri was Chairman of the *Arson Investigator Panel* with Robert E. May, Department of Law Enforcement, State of Illinois and Lt. Williams R. Rucinski, Department of State Police, East Lansing, Michigan as panelists.

4 Conference participants were: Chief George Alexander, Fairfax County Fire and Rescue Service, Fairfax, Virginia; Dr. Irwin Benjamin, Chief, Fire Research Section, Building Research Division, National Bureau of Standards, Washington, D.C.; Chief John P. Breen, D.C. Fire Department, Washington, D.C.; Dexter Bullard, Jr., M.D., Rockville, Maryland; Robert E. Carter, Supervisor, Fire Training Services, State Department of Education, Richmond, Virginia; Dan Econ, Director, Investigation,Service, Property Loss Research Bureau, Chicago, Illinois; Professor Irving N. Einhorn, Flammability Research Center, University of Utah, Salt Lake City, Utah; Donald Flinn, International Association of Fire Chiefs, Washington D.C.; David J. Icove, Knoxville, Tennessee; Eugene L. Jewell, Chief, Arson Bureau, Division State Fire Marshal, Columbus Ohio; Dr. Bernard Levin, Assistant to the Director, Center for Fire Research, National Bureau of Standards, Washington, D.C.; Dr. Robert S. Levine, Associate Director for Fire Science, National Bureau of Standards, Washington, D.C. 20234;

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EARTHQUAKE PREDICTION AND PUBLIC POLICY: DISTILLATIONS FROM A NATIONAL ACADEMY OF SCIENCES REPORT [1]

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By 1973, accumulating empirical evidence and a promising theoretical break-through (Scholz et al., 1973) had made the imminent prospect of earthquake prediction credible. Concerned scientists and public officials quickly began asking what should be done if the premonitory signs of a potentially destructive earthquake were detected for a heavily populated area. When and how should the prediction be released? Was there a real danger that releasing the prediction would provoke mass panic, public disorder, and economic disaster? What steps might be taken in order that the community would benefit from a period of advance warning? Such conerns as these led to the establishment in April 1974, of the Panel on Public Policy Implications of Earthquake Prediction, within the National Academy of Sciences. The Panel was mandated to

> provide advice to the Federal Disaster Assistance Administration, Department of Housing and Urban Development, that will serve as a basis for the formulation of public policy relating to an expected earthquake prediction capability. The types of governmental response with which the Panel will be concerned include warning of public officials and of the general public; governmental actions to mitigate the loss of life and property; and the need for further studies and research.

The resulting report was an effort to combine principles from several behavioral sciences with insights from practical experience in disaster planning. Although it highlighted problems for investigation by behavioral scientists, the report was primarily intended for use by decision-makers in federal, state, and local governments and in private agencies; by leaders in the business community and other parts of the private sector; by scientists and engineers concerned with disaster prevention, mitigation and preparedness; and by interested citizens.

The work of the Panel can be summarized under four broad sets of questions. First, what are the policy-relevant characteristics and circumstances of prediction likely to be, what are the main hazards of earthquakes, and what might be the elements in a constructive response to prediction, taking account of the identified hazards? Second, what do we know about response to warnings of disaster that might help in planning for the constructive release of predictions? Third, what economic and legal implications of prediction and what potential problems of inequity must be taken into account in planning a constructive response? And what complications should be anticipated as response planning becomes enmeshed in the political process? Finally, what concrete actions might be taken in response to an earthquake prediction, and what conclusions and recommendations can be drawn from the entire investigation?

EARTHQUAKE PREDICTION AND HAZARD

Prediction

Non-specific forecasts, such as the warning that a major earthquake is bound to occur along the southern California section of the San Andreas fault within fifty years or a century, and risk mapping that identifies faults along which earthquakes seem most likely to occur are already familiar to the denizens of earthquake country. But the new prospect is for predictions that specify the place, time, and magnitude of the quake within fairly close limits. Unlike the older procedures, prediction depends upon detecting premonitory signs, such as surface tilting and changing physical properties of rocks under stress, that occur in advance of a specific quake. Although earthquake prediction is still in a research and development stage, and instrumentation is too sparse in most locations to insure detection of premonitory signs, a few quakes have already been convincingly predicted, and impressive evidence from the Soviet Union, Japan, and China reveal precursors similar to those observed in the United States.

The following anticipated characteristics of earthquake prediction (Greensfelder, 1974; Kisslinger, 1974; Scholz et al., 1973) seem especially relevant for policy considerations. (1) For earthquakes severe enough to subject communities to substantial risk, premonitory signs should be observable months or years before the event. The prospect of long lead times makes earthquake prediction quite different from such familiar occurrences as flood, hurricane, and tornado warnings. (2) When instrumentation is adequate and sufficient baseline data have been accumulated, the prediction lead time should increase with the quake's magnitude. Lead times as long as ten to forty years have been projected hypothetically for major earthquakes. (3) Assurance and specificity of a given prediction will probably improve incrementally over an extended period of time, starting with ambiguous and incomplete signs of tectonic stress. Accordingly it is impractical to think of withholding information until some strategically selected moment when the refined prediction can be issued in its final detail. (4) At present it appears that not only the lead time but the length of the *time window* for a prediction will vary directly with the impending quake's magnitude. In the case of major quakes, it may only be possible to specify the time of predicted occurrence within a time window of from one month to even a year or more. Unless the time window is narrowed, short-term remedies such as evacuation, closing down essential services, and maintaining key personnel on round-the-clock alert status may be infeasible. (5) Unlike floods, hurricanes, and tornadoes, earthquakes are preceded by no external signs through which the public can make their own informal confirmations of the prediction or identify the moment of occurrence. Hence earthquakes will be distinctive among natural disasters in the extent to which public response will depend exclusively on the faith people place in scientific prediction. (6) Minor quakes occur frequently, while potentially destructive quakes in any specific locality are usually separated by decades. If many small quakes are successfully predicted, people will become accustomed to prediction without being prepared to deal with the infrequent serious quake. Because of the long intervals, every prediction of a serious quake is likely to be the first such experience for most of the inhabitants of the affected area and for most of the personnel charged with preparing for the event. Hence there is little hope of accumulating experience within the local community for dealing with predictions of significant quakes. (7) Within the foreseeable future, it is unlikely that predictions can be made with a high degree of certainty, and likely that some quakes will occur without being predicted. Nonscientific predictions will surely multiply as public awareness of prediction capability increases. Hence earthquake prediction seems

sure to be plagued by problems of public credibility. (8) The hope has been voiced that seismologists might sometimes issue negative predictions, i.e., assurances that an area will be free from damaging quakes for some specified period, or that certain predicted quakes and their aftershocks will "immunize" the area for several decades. For the present, neither the evidence nor the understanding of seismic phenomena will justify such assurances. (9) Although there is some hope for an eventual earthquake control capability, there is no realistic prospect of having such operational capability in time for inclusion in the current armory of responses to prediction. (10) Present understanding of earthquake precursors in the United States applies best to the Western states, but the earthquake hazard exists in such widely dispersed areas as Missouri, South Carolina, and Massachusetts. (11) Understanding of premonitory signs is an inevitable by-product of research into earthquake dynamics. While we might slow down the refinement of earthquake prediction capability by enforcing a policy against further efforts to achieve prediction, we cannot stop it. Hence we now have no choice but to accept earthquake prediction capability as an accomplished fact and seek to make the most constructive possible use of it.

Earthquake Hazard and Constructive Response

The primary effects of earthquakes are death, injury, and suffering; damage to systems and structures; and disruption of normal activities. Most deaths and injuries are from collapsing structures, falling debris such as bricks and glass, tsunamis, land slides, floods from collapsed dams and levees, earthquake-induced fires, and release of toxic, chemically reactive, and radioactive materials. It is important in planning the response to earthquake predictions to realize that people can be relatively safe in the earthquake vicinity if they are at a safe distance from these largely man-made hazards.

In California, where seismic safety standards have been incorporated into building codes since 1933, a sizable fraction of the population still live and work in unsafe structures. In other regions of the United States there are relatively few buildings except modern high-rise structures that have been constructed with earthquake resistance in mind. There is still much to be learned about earthquake-resistant construction, especially in relation to those very infrequent quakes classified as "major". Lifelines, which include transportation, communication, energy, and water systems, are particularly vulnerable in earthquakes. The collapse of a single bridge, or the rupture of an aqueduct, natural gas line, or power line, threatens normal life processes in an entire community. Since most existing facilities were not built for seismic resistance, lifelines demand special attention when an earthquake is imminent.

Given an earthquake prediction, what new measures can be taken to reduce the deaths, injuries, property losses, and disruptions just enumerated? What more can we do if we are given advance warning of the approximate place, time, and magnitude of an impending quake than we could have done without the warning? The measures making up a complete program for utilizing an earthquake prediction can be grouped under five headings:

1. Authenticating and issuing predictions and warnings;
2. Implementing a hazard-reduction program to minimize the loss of life and property and community disruption when the quake occurs;
3. Readying emergency services to deal with the situation after the quake has occurred;
4. Controlling and offsetting potentially counterproductive consequences of the prediction;
5. Pre-prediction planning for each of the foregoing sets of tasks.

In the following sections, we shall take up these tasks in order, except that pre-prediction planning will be discussed simultaneously with each of the other topics.

ISSUING PREDICTIONS AND WARNINGS

Responses to Warnings of Disaster

Early in the Panel's deliberations we found it helpful to distinguish between predictions and warnings. A *prediction* is a neutral statement indicating that an earthquake of a specified magnitude will probably occur at a specified location and time. A *warning* is a recommendation that normal life routines should be altered for a time to deal with an impending danger. Predictions are based on scientific analysis of signs known to have preceded earthquakes in the past. They say nothing about how people should respond, and are unaffected by public policy considerations. Warnings will follow some, but not all, predictions. Based on assessment of the prediction and the associated conditions, a warning identifies the situation as one of danger, in which the risk to life and property can be reduced by appropriate response.

A crucial policy question is how to release earthquake predictions and issue warnings in such a way that the response will be constructive and not counterproductive. Because there have been no previous opportunities to observe how people and organizations respond to earthquake predictions and warnings, we must turn to analogous events in seeking answers to the question. Three sources appear to be relevant:

(1) previous studies of response to warnings in other types of disaster;
(2) analyses of long-term disaster-preparedness problems; and
(3) analyses of such slowly developing social problems as the energy and environmental crises.

(1) Research into a variety of wartime and peacetime disasters has revealed a widespread proclivity to suppress predictions of danger and delay the dissemination of warnings until it is too late for maximum benefit. A stereotyped belief that people will panic when warned of danger is often the reason for suppression and delay. But the findings from this same body of research are that most people do not respond to disaster warnings with panic, hysteria, or other non-rational or uncontrolled forms of behavior, and that "mass panic" is largely a figment of the imagination (Fritz, 1961; Quarantelli and Dynes, 1972). A more likely response derives from the "normalcy bias" (McLuckie, 1973, p. 22), i.e., the tendency for people to accept most readily any information that enables them to disbelieve the prediction, minimize the danger, and view the situation optimistically. The ambiguities in the predictions released during the next decade or more will provide adequate scope for wishful disbelief, and long lead times can make the danger seem too remote to require action.

The response to warnings will vary by community and group. Groups with recent disaster experience are more likely to respond constructively to warnings (Anderson, 1970). "Disaster cultures" (Moore, 1964; Dynes, 1974) develop in areas exposed to recurrent disaster threats, with the result that public officials and citizens alike show a high degree of sensitivity to the threat of disaster. At present we have little evidence of a well-developed "earthquake culture" to compare with the consciousness of risk in coal mining communities or tornado country, even in California. But it is likely that Californians, Alaskans, and Hawaiians will more readily assign credibility to an earthquake prediction and participate cooperatively in community response plans than people in Missouri, South Carolina, or Massachusetts. Experience can also have a lulling effect. Most California communities have been subjected to only minor earthquakes for several decades, and many inhabitants may take an earthquake warning lightly because of this past experience.

Existing disaster studies indicate that elderly people, the handicapped, persons of low socioeconomic status, and members of minority ethnic and foreign speaking groups are least like-

ly to receive, understand, or believe disaster warnings. Because of past grievances and hostilities, many members of minority groups will assign little credibility to the official sources that disseminate warnings, and consequently will not be disposed to take appropriate precautionary actions.

Popular disbelief and inaction will be enhanced if public officials delay issuing warnings or attempt to suppress predictions until they can be quite certain that the danger is real. Officials will be concerned about what false alarms might do to their credibility and future effectiveness, possible legal problems associated with erroneous predictions, and potential disruption of the local economy. At the same time they must realistically take notice of the uncertain and imprecise nature of the early predictions. Based on these considerations and evidence of official behavior in other types of disaster warning situations, Haas (1974, p. 50) has hazarded the guess that "Public officials in the areas to which the forecast applies will try to avoid taking a position publicly on the probable validity of the forecast. To the extent that this is impossible, their comments and actions will tend to undermine the credibility of the forecast."

The situation will be further complicated when national attention focused on the designated area leads to a "convergence" of people and messages toward the threatened area or toward centers of information and communication in or near the area (Fritz and Mathewson, 1957). Visiting scientists, government officials, mass media representatives, businessmen, and the general public may deluge the agencies responsible for predictions and warnings with requests for additional information. Curious outsiders will tour the threatened area, and thrill seekers will converge as the predicted time approaches. Such convergence responses may temporarily overload transportation and communication networks and tax the work capabilities of agencies involved in planning and executing responses to the earthquake warning.

It is important that we remember that the experience with disaster warnings on which we based the preceding discussion is not entirely comparable with the projected earthquake warning pattern. Earthquake warning times will be longer, there will be no natural signs by which people can confirm the imminent danger through their own senses, earthquakes of destructive magnitude occur less frequently, and false alarms can be more costly because of the long period of advance warning. Accordingly, we look to experience with long-term disaster-preparedness and slowly developing social problems for further clues to earthquake prediction response.

(2) Analogies to the long period of advance warning for earthquakes may be found in efforts to achieve long-term disaster-preparedness. The relatively successful efforts have occurred in coal-mining communities where the danger is ever-present and in areas frequently affected by floods and hurricanes. In general, however, well organized and effective long-term preparations for disaster are exceptional. Surveys on the status of both peacetime and wartime disaster preparations have consistently shown that only a small percentage of the population will voluntarily undertake preparation to cope with uncertain future disasters. Even in a community like Crescent City, California, which experienced a disastrous tsunami in 1964, little long-term emergency planning for similar future disasters has been undertaken (Anderson, 1970).

With reference to earthquakes, such long-term hazard-reduction programs as land-use planning and building regulations designed to protect against seismic disturbance are infrequent outside of California and Alaska. Even in high-risk areas of California and Alaska, many communities have failed to adopt or enforce adequate regulations of this sort, and little has been done about structures built before such regulations took effect. Building codes mean added costs for enforcement to owners and the government. Condemnation of old buildings breaks up neighborhoods, creates relocation

problems, and can enhance conflict between special-interest groups (White and Haas, 1975). It is difficult to secure agreement and cooperation among owners, engineers, architects, builders, lending institutions, insurance companies, and government officials. Groups advocating disaster preparedness compete with others who want limited national and local resources used for more immediate, imperative, or well-defined social and interest-group needs. In case of an earthquake prediction, there is real danger that preoccupation with immediate and pressing social and personal concerns will block efforts to capitalize on the long period of advance warning in case of a serious earthquake.

(3) The energy crisis, as a slowly developing social problem, supplies another partial analogy to earthquake prediction. A carefully considered prediction of declining oil production in the United States after ten to fifteen years was issued as early as 1956. The petroleum industry first reacted to the prediction with dismay and disbelief and then attempted to disprove it, leaving the public badly confused (Gillette, 1975). Subsequently, various groups sought to draw public attention to the imminent shortage unless wasteful consumption were reduced and alternative energy sources exploited. But it required the Arab boycott seventeen years later to provoke public awareness and vital concern with the energy crisis. Even then, serious attention to the problem was short-lived, though it is difficult to say whether a natural return of public apathy or the failure of national leadership accounted for the decline of interest.

The energy crisis raises questions about the length of time required to draw adequate attention to the earthquake hazard and about sustaining the awareness once it is developed. The analogy also suggests that some large business organizations that fear financial reverses during an interval between prediction and quake may hire their own seismologists to dispute the evidence on which the prediction is based or the assessment of danger upon which a warning is based.

The lesson from this review of partially analogous situations is that resistances and constraints must be faced squarely by federal, state, and local officials charged with developing earthquake warning systems.

Issuing and Authenticating Predictions

The earthquake prediction and warning process may be viewed as comprised of four basic functions: (1) developing and releasing the prediction; (2) evaluating the technical merit of the prediction; (3) judging appropriate response to prediction; and (4) disseminating the warning. Drawing upon the foregoing discussion of expected responses to predictions and warnings and upon experience with hurricane and tornado warning systems, we shall briefly suggest how each of these functions might be handled.

First, detection of premonitory signs that may lead to earthquake predictions can occur in federal installations, universities. and private research institutions. Scientists identifying these signs will experience conflicting incentives, toward early publication of predictions, and toward delay in releasing the information. The principal pressure against both premature release and undue delay or suppression is peer pressure within the scientific community. Several decades hence, when scientific advance and practical experience have produced a near consensus in the scientific community, we may wish to consider the desirability of establishing one central agency through which most predictions might be issued, coupled with appropriate warnings. But given the currently limited understanding and agreement among seismologists and incomplete instrumentation and base line data, we cannot now justify restricting the issuance of earthquake predictions to a single source, either public or private. Neither is it practical to delay informational releases until scientific consensus is reached. Because of the

great public interest in the prospect of a serious earthquake, it is doubtful that information leaks could be prevented by any means. Furthermore, efforts to restrict public release of predictions would inevitably stifle exchange of information among scientists, which in turn would retard progress in testing competing theories and generating new insights about earthquake prediction.

The most constructive policy is therefore one that encourages prompt release to the public of information that, in the judgment of the scientists concerned, warrants prediction of an earthquake or revision of an earlier prediction. Predictions should flow freely from a variety of scientific sources, in accordance with the scientific freedom enjoyed in this country.

The second function, evaluating the technical merit of the prediction, must also be performed by scientists rather than public officials. The most searching and authentic evaluation will take place through the usual media for academic discourse. But the public official who must decide when to issue a warning and what measures to initiate needs a recognized body of scientists to whom to turn for a prompt, balanced, and unassailable evaluation of any prediction of a potentially destructive quake. Few states have the scientific personnel needed for such a panel, and greatest credibility will be accorded a nationally based group, relatively detached from local and regional political scenes. Hence, the federal government should constitute such a panel now and establish its mode of operation in advance of the first significant prediction.

Issuing Warnings

The third function, determining the appropriate response, must ultimately be the responsibility of local and state officials and leaders in the private sector. However, the federal government is more favorably placed for accumulating experience with earthquakes and predictions under diverse circumstances and for developing technical advisory services. State and local leaders will retain the responsibility for initiating action when a prediction is at hand and for adapting model responses to the local situation. They should develop plans suited to local needs well in advance of the first prediction, while drawing liberally upon the resources of the federal government.

The fourth function, disseminating a warning, will be a momentous step for the public official, who now assumes responsibility for orchestrating a constructive response. The most important immediate concern is that prompt issuance of a warning, including assessment of risk, information concerning community plans, and advice for individual action, not be hindered by uncertainty over the locus of authority. The threatened area will certainly overlap local jurisdictions and sometimes include more than one state. Hence, it is important that the federal government initiate discussion with representatives of governors in potentially affected states to establish responsibilities and procedures for the issuance of warnings. Although the elaborate hierarchy of outlooks, advisories, bulletins, and watches employed for hurricane and tornado warnings may not be useful because of the infrequency of significant earthquakes, comparable terminology should be employed when it is applicable.

The development of a coherent earthquake prediction and warning system will require cooperation among scientists, public officials, and the communication media to provide understandable and unsensational interpretations of reported predictions. A continuing informational program is needed to ensure that public officials and citizens learn directly from scientists the nature of their thinking about earthquake mechanisms and prediction. Public officials, the media, and the general public will require the advice of a disinterested group of scientists in distinguishing valid from doubtful predictions. Cooperation of the communication media will be important in helping people to visualize concretely the laboratories, the

seismographic networks, and the panoply of instruments and devices through which predictions are developed. Outlining concrete response plans should help to add a sense of reality to the warnings as well as to forestall some disorganized and disruptive responses. The development of constructive ways in which citizens and groups can participate actively in preparedness programs should also help to bolster public credence. Emergency plans should provide for activation of citizen involvement directly upon issuance of a warning, with intensified and broadened involvement as the predicted time approaches.

THE CONTEXTS OF RESPONSE TO EARTHQUAKE PREDICTION

Economic Implications of Prediction [2]

Our review of evidence concerning public response to warnings of disaster has shown rather convincingly that the fear of mass panic is unjustified and that the crucial problems will lie in overcoming disbelief and inaction. Even though the popular reaction is the obvious place to start our investigation, the response of economic institutions to the prediction and warning may have more far reaching effects on the community. Will there be large-scale economic disruption because of the prediction? How will land markets and financial markets react? How will economic decision-makers process the information?

In the absence of comparable experience, predicting the economic response will probably be more difficult than predicting the popular response. Decisions affecting the economy will be made in private businesses, public agencies, and households, and by decision-makers within the affected community and in remote parts of the nation and the world. Each set of decisions will affect all others according to complex and ill-defined patterns, ranging from a possible domino effect to more complicated patterns of counter-response and offsetting-opportunity response. Panel members were unable to locate empirical models of sufficient precision and richness to describe these interactions confidently.

The simpler problem of individual economic decision-making under conditions of uncertainty focuses our attention on the probabilistic character of the earthquake event, the probabilistic assessment of the prediction, and a probabilistic assessment of the payoffs for various adjustment mechanisms. Most economic decision-making models assume that individuals seek to maximize expected gains and minimize expected losses, after adjusting the value of gains and losses by the probability of their occurrence. Reasonable as such models are, they may supply a poor guide to economic response to earthquake prediction for at least two reasons. First, none of the probabilities can be specified with much precision. Until we have had experience with a few predictions of significant earthquakes, we are nearer to guessing than to "estimating probabilities." Second, empirical studies of response to uncertainty suggest that decision-makers usually employ highly simplified models of the real world. The most frequent goal of popular economic decision making is to attain an adaptive level of outcome rather than to maximize gains. Research on economic response to natural hazards suggests that potential gains and losses may be disregarded unless a very high probability is initially assigned to the predicted event (Slovic et al., 1974).

Parallel to the fear of panic flight reactions by the populace is a common fear of panic reactions in the economic sphere with resultant disruption of the economy. We cannot be certain how likely these responses are to occur. But all previous experience with regional reactions to bad news tends to support the view that the economy would not be thrown into panic. Attempts to suppress information regarding the prediction could well generate rumors and lead to excessively speculative behavior. An open information policy to keep the public informed

about a possible impending disaster should minimize damaging speculation. In contrast to panic, however, some rational downward adjustment of real estate and financial markets in anticipation of future losses should be expected. Future losses might be lessened by reducing levels of employment, production, and investment within a geographical area judged extremely hazardous; and vulnerable activities might be transferred to other parts of the region or nation. Some economic loss and economic disruption are inevitable. Public assistance for relocating vulnerable activities, aid for reinforcing structures, financial support for public utilities and local governments, a program of federal earthquake insurance, and increased unemployment insurance would do a great deal to stabilize the economy and speed the adjustment process. Federal aid given prior to an earthquake to lessen the negative economic consequences of earthquake warnings may be less costly than traditional post-disaster relief and rehabilitation. But with the advent of long periods of advance warning, the affected region can and should bear much of the cost of adjustment. In order to avoid creating incentives for businesses and residents to remain in hazardous areas without taking steps to reduce risk, grants of aid should be linked to concomitant measures for reducing risks, such as strengthening buildings and removing parapets and other dangerous parts of buildings.

Since the greatest economic gains and losses from earthquake prediction occur in the private sector, it is important to anticipate how different types of businesses can be affected. Reactions of banks, lending institutions, and insurance companies are certain to have a multiplier effect on the local economy. But their reactions will be influenced by federal insurance and aid policies. Standby federal pre-disaster policies to cushion the potential impact of a sudden tightening of credit would probably be desirable. If public pre-disaster policies are established and known in advance, economic reactions within the region should be considerably milder than if there is no published pre-disaster policy at the time the prediction is issued.

Where probabilities of loss are high, securities and real estate markets will probably register declines very quickly. By contrast, small firms and households may wait for more information and not take action until strong public action is evident or until they are affected by the decisions of large-scale firms and financial institutions. Income and employment multiplier effects of the first reactions to the prediction may take several months to result in reduction of personal income and a rise in regional unemployment.

Businesses whose sales are tied to the level of local income and employment may be harder hit than industries whose sales are primarily outside the region. A tendency to postpone durable investments subject to possible damage will be strong. New housing starts and business construction will probably decline and remain down until after the expected quake. Partially offsetting these tendencies will be a demand to strengthen many types of structures and to build up some kinds of inventories. The strength of these demands will depend upon the availability of funds in the money market as a whole and the financial reserve positions of firms and households.

As a tool for hazard mitigation in case of earthquakes, insurance has both its advocates and its detractors. Compulsory disaster insurance, covering all hazards including earthquakes, could distribute costs in both space and time and cushion many of the economic reverses anticipated as a result of an earthquake prediction. Variable premium rates could be used as incentives for increasing the seismic resistance of existing structures. Federal subsidy for insurance could be justified as taking the place of some of the massive federal expenditures that normally follow a disastrous quake. However, existing federally subsidized disaster insurance and privately offered earthquake insurance have been in low demand, and there

are considered doubts concerning the political acceptability, the practical effectiveness, and the feasibility of this comprehensive approach to the economic problems of earthquake prediction through insurance.

Current policies for property insurance are based on the law of large numbers and the pooling of reserves, and are well suited to events such as building fires that occur sporadically and independently. Damages in case of earthquakes are interdependent, however, and there is a problem of adverse risk selection for an entire region. Prediction of a serious quake in a specific region may serve to make clear that reserves based on the law of large numbers could be inadequate to cover anticipated losses. Even with very little earthquake coverage in force, this may apply to fire and extended-coverage insurance. Insurance companies could hardly afford to sell new coverage in the affected area once a prediction was issued, and would experience considerable financial incentive to cancel existing coverage whenever possible. Insurance companies having the legal right to refuse renewal of policies on commercial and residential structures after an earthquake prediction has been issued would find it costly to do so on political and public relations grounds. Without new customers, and with rate increases unlikely to be granted, insurance companies could well find themselves in difficulty after an earthquake prediction. These considerations raise further the question of whether current insurance practices should be thoroughly reexamined in light of the new prospect of an extended period of predicted hazard before the quake occurs.

If local property values fall and if the economy dips following a prediction, property- and sales-tax revenues that account for more than two-thirds of local public revenues will decline. Maintaining schools and other public services will be difficult. If tax incentives are employed to encourage local property owners to reinforce structures, even further losses may be encountered. Public utilities will incur new costs for investment in hazard reduction while their revenues decline. A comprehensive disaster policy is needed both to specify the types of federal aid that will be available in the predisaster period and to determine to what extent taxpayers in other regions should be liable for hazard-reduction in earthquake-prone regions.

Thus far we have been talking of the prediction and warning as public knowledge, available to all. Private foreknowledge (inside information) can lead to redistributive gains and losses without any net benefit to the community (Hirshleifer, 1971). If predictions are prematurely released to insiders, if diffusion of information is imperfect, if some groups can buy superior information through private predictions, then speculators will be in a position to gain at the expense of others through market transactions. If we are to minimize socially undesirable inequities in the distribution of income, it is essential that we insure the prompt release and effective dissemination of all predictive information and warnings as they become available. Thus economic considerations reinforce our earlier conclusion concerning the dangers of delay in releasing predictions.

An important contribution economists can make to our ability to exploit earthquake prediction capability in the public interest will be to conduct comprehensive benefit/cost studies of the various proposed measures for reducing the earthquake hazard. Current procedures for loss estimation have serious economic deficiencies, and refinements are urgently required before useful benefit/cost analyses can be completed.

Legal Implications [3]

The production and issuance of earthquake predictions and warnings and the development and implementation of plans for responding to the predictions take place within a legal system that defines responsibilities and liabilities, and that permits certain actions and prohibits others. A program of hazard mitigation that sub-

jects scientists, public officials, or others to intolerable legal risk will fail, regardless of how well conceived it may be in other respects. Likewise, a program that is well conceived by social, economic, and engineering criteria may be infeasible because of the legal obstacles to its execution. It is essential to understand these legal constraints so as to devise programs that minimize them, or to seek new legislation that will facilitate otherwise infeasible programs.

As part of the Panel report we have recounted legal opinions in answer to several of the most pressing questions surrounding earthquake prediction. The opinions, however, are quite tentative because of the lack of adequate precedent. Furthermore, each answer is hedged about with a set of restricting assumptions concerning the circumstances in which the opinion applies. Consequently it has seemed wise in this presentation merely to identify the questions explored and the main drift of the answers.

Scientists and public officials who release predictions or issue warnings that turn out to be false alarms or erroneous in some significant respect are concerned over whether they incur liability to those who suffer damage or injury because of the prediction or warning. In most cases the publication of such notices should not create liability, provided the announcements are conscientiously issued, based on adequate evidence, and appropriately couched as fallible judgments rather than established facts. On the other hand, if a prediction or warning is withheld for fear of public harm, the possibility of incurring liability in case the quake occurs may be substantial.

In the abstract, land use control powers are among the most promising tools for minimizing death and destruction in a predicted quake. But the immediately practical question is how far individual property rights and other legal constraints stand in the way of implementing land use controls or an emergency basis. When land use controls have the effect of denying a property owner the right to use his property in the usual manner, to what extent must the property owner be compensated for any loss? If a survey of existing buildings is necessary in order to determine what modifications are required, with what success might property owners block or delay entry of inspectors onto their property? What authority is there to enforce modifications in structures built prior to the enactment of recently upgraded building codes? What authority is there to compel property owners to discontinue use of a vulnerable structure for specific purposes, such as a meeting place or a residence? Without attempting to answer these questions, we note that the first few efforts to implement a hazard reduction program based on an earthquake prediction are likely to encounter a series of challenges in the courts, which in total will probably consume several years in litigation. There may very well be insufficient time to overcome each of the obstacles so as to make optional use of hazard reduction measures involving land use control and building code implementation before the quake occurs. Accordingly, it is important to seek appropriate legislation now and make legal preparation at the local, state, and federal levels in advance of the first prediction.

Several other significant questions have been raised. What legal powers are there by which government might offset the dampening effect on the community of a constricting mortgage market? Could and would a credible earthquake prediction be interpreted as an "emergency" under provisions of the Disaster Relief Act of 1974, thereby making disaster assistance available to communities affected by the prediction? It appears unlikely that certain answers can be given, suggesting that clarifying legislation should be enacted.

The Problem of Equity

Disasters affect different population segments unequally, and so do the predictions and the hazard-reduction measures which are set in motion following the prediction. In our justifiable preoccupation with fostering the general

community welfare we can easily overlook the inevitable inequities.

Dangers of death and injury from an earthquake are greatest for people who live in substandard buildings that are structurally weak or vulnerable to fire. These are likely to be older buildings, disproportionately inhabited by the poor, the elderly, and members of minority groups. These population segments are also least likely to possess the personal resources needed to protect themselves in advance from the earthquake hazard, or the political and economic clout necessary to induce landlords and public agencies to implement hazard reducing measures in their behalf. These and other groups who live relatively isolated lives are also least likely to receive warnings promptly when they are issued or to have access to resources and to people who can help them determine just what the warning means for them.

After a disaster has struck, the nature of damage and injury is generally evident to those most directly affected. But the risks to which people are subjected as a result of an earthquake *prediction* – such as economic loss – will not be readily apparent at first. People will not automatically recognize their interests in the face of complex economic, legal, and political maneuvering and unpredictable public responses. The advantage will lie with those who are already represented by well-organized interest groups, which have the resources to examine the situation in depth and ascertain the groups' interests. Small property owners, tenants, and employees in non-union establishments are among those unrepresented groups who are unlikely to recognize potential threats to their interests until it is too late to take protective action.

In most natural disasters the brutal impact on the victims is partially offset by the rise of an unusual spirit of altruism in the community (Barton, 1969; Dynes, 1974). For some people with minimal resources, who are closely tied to the local community by economic necessity or sentiment, the *prediction* of an earthquake may be a disaster. Their losses appear more like an intensification of normal hazards of life than the consequence of a dramatic catastrophic event. As an *invisible catastrophe*, a prediction that precipitates public and organizational responses which ultimately destroy the economic well-being or life style of a population segment is unlikely to evoke a sudden altruistic outpouring among the less affected. Because the prediction, the warning, and the public and private responses are all human actions, the clear mandate of sympathy for the victims of natural catastrophe is muted by confusion over responsibility and blame.

Even the most constructive hazard-reducing steps that can be taken in response to an earthquake warning may hurt some of the people while helping others. For example, it would be sensible in response to a long-term prediction to set stricter building standards in the threatened area and to insist on strengthening and fireproofing many existing structures. But if all or part of the expense is borne by the property owner, directly, or indirectly through increased assessments, the increased costs will drive still more of the economically less well-endowed populations out of the market for conventional housing. Furthermore, the long record of special influence and unevenness in the implementation of land use planning and enforcement of building codes is not likely to be reversed overnight.

No set of rules will automatically insure that the interests of the politically and economically weak and the socially isolated are given adequate attention. It is essential that some public agency be assigned responsibility to serve as watchdog in this regard. Non-governmental community groups will have an important role to play in identifying actual and potential inequities and devising programs for dealing with them constructively.

Political Implications

Political officials will ultimately have to re-

solve the many uncertainties of earthquake prediction to the best of their abilities and exercise leadership in dealing with them. It is important to understand some of the ways in which the political process can affect the making and implementing of decisions, so as to judge how constructive government action can be facilitated.

Mitigation of earthquake hazards has been a lively regional political issue directly after damaging quakes, but interest flags soon after the crisis. Experience suggests that significant advances in earthquake hazard reduction can be achieved if well-conceived legislation and administrative regulations are introduced in the favorable political climate immediately after an earthquake disaster and if authority for implementation is vested in strong and independent government agencies. But will the same conclusion apply to the earthquake *prediction* or *warning*?

The effect of a prediction on the political process may be quite similar to the effect of an actual earthquake when the prediction is given credence in the scientific community and there is only a short interval of days or weeks before the anticipated event. If well-conceived pre-prediction plans are already at hand at local, state, and national levels, capable leaders may win support for what otherwise might be quite extraordinary programs. Without pre-prediction planning, however, frustrated public demands for immediate and comprehensive action may well contribute to community conflict and precipitate ill-considered government action. When the predicted lead time for the quake is longer and the probability of error is substantial, any initial consensus regarding standard emergency preparedness measures may soon dissipate. Without strong and consistent leadership, interest group conflicts over hazard reduction measures and interagency conflict over responsibilities might bring constructive efforts to a standstill.

Issuance of any earthquake prediction bearing the seal of scientific authenticity will subject public officials to immediate demands for clarification and action, with the mass communications media vigorously relaying the demands. Even with a moderately high-probability short-term prediction, political leaders may be tempted to delay issuing warnings because of the need for coordination among several affected political jurisdictions, the common fear of panic we have discussed earlier, and a fear of lessened credibility in case of a false alarm. When the lead time is longer, and especially when the prediction time-window is a long period, a concern over potentially damaging effects of the warning on the local economy will add to the pressure for delay in issuing any warning. Testimony before the Joint Committee on Seismic Safety of the California Legislature on December 13, 1974, and letters from California public officials to the Panel sound a recurring theme, that warnings should not be issued, or that predictions should be suppressed, until there is virtually complete certainty concerning the predicted event. While the public official's own concerns and pressures from some segments of the business community may cause delay in issuing a warning, political and community pressure from other sources will ultimately force the official to issue a warning. But the consequences of delay and of issuing the warning only in response to public pressure will likely be a residue of bitterness and distrust and a lowering of the reservoir of initial support for difficult actions.

After the warning is issued, public officials will encounter quite different degrees of public understanding and appreciation for the three major tasks confronting them. Preparation for post-disaster emergency response will be readily understood and universally applauded. The public will readily appreciate the need to devise hazard reduction plans, but will often be less sanguine about specific measures and the potentially great costs involved. The need to cope with potentially counterproductive responses to the prediction may come as a complete surprise to many people, and there may be little under-

standing or enthusiasm for such programs until the deleterious consequences have been deeply and widely felt on a personal basis.

Public officials can capitalize on the general appreciation of emergency preparedness by organizing opportunities for widespread citizen involvement in preparing for the quake. Participation in emergency preparedness can be made the occasion for educating a wide spectrum of citizens to the practical measures for hazard reduction such as accelerated land use planning, stricter enforcement of building codes, and selective reinforcement and demolition of dangerous structures. Although efforts to anticipate and forestall counterproductive developments may attract little support, citizen groups may be quick to blame local officials if business and employment decline. Hence, it will be important for officials to seek guidance from a respected body of technical advisers and to filter proposals through a larger citizens' group. If these are acting rather than delaying bodies, they should help transfer the difficult decisions out of the realm of political controversy and make some contribution to public confidence.

Although an earthquake prediction pinpoints a localized problem, local and even regional resources will be inadequate to finance an adequate program, as we have indicated in discussing economic aspects. It will not be easy to secure federal assistance on a large scale prior to an actual earthquake. Support for relief in connection with annual hurricane, tornado, and flood threats in other regions may be an effective trade-off in political log-rolling. The federal approach to new problems has been described as typically *incrementalist*, i.e., extending and adapting old programs to new situations rather than devising wholly new approaches (Lowi, 1969; Braybrooke and Lindblom, 1963; Wildavsky, 1964). Accordingly, the most promising approach to securing federal aid should be through seeking modifications of existing federal disaster insurance programs, guaranteed low cost loans for construction, extended periods of eligibility for unemployment insurance, and similar programs.

While evacuation is a familiar approach to many disasters, large scale evacuation in response to earthquake prediction will usually be politically unacceptable, as well as impractical in other respects. Experience with tsunamis and other threats indicates an uncertain public response to government-ordered evacuation of limited areas and vacating of designated structures. When danger is imminent and obvious, as it was in the area below the Van Norman Dam following the San Fernando earthquake of 1971, general compliance with an evacuation order can sometimes be achieved with little difficulty. But with a long lead time, no visible threat, and acknowledged uncertainty over the prediction and the quake's effects, and the possibility that evacuation might last for weeks or months, evacuation plans will become politically quite controversial.

Steps will have to be taken to deal with existing unsafe structures, but conflict will certainly develop over the "taking" of private property and the dispossession of people. Officials must formulate plans with several potent political considerations in mind. First, there must be a sense of active preparation for the quake rather than passive waiting. For example, it is better when possible to demolish unsafe structures rather than to leave them vacated as a blight on the community and an invitation to squatters. Second, work on upgrading and demolishing unsafe structures should be carefully scheduled so as to take up some of the anticipated slack in new construction activity between prediction and quake. Third, considerable thought must be given to minimizing the minor irritants (such as charges for inspection imposed on small property owners) that can easily accumulate, creating an escalating resentment and undermining the disposition to cooperate in community-wide programs of hazard reduction. Fourth, public officials must anticipate and deal constructively with a disposition among the poor and minority groups – who disproportionately inhabit substandard housing – to take a cynical

view of strict building code enforcement and plans to relocate inhabitants from unsafe to safer locations. Long experience has taught them that building codes often have more to do with protecting the building industry and trade unions than with safety for building inhabitants, and that urban redevelopment is often a device to remove the poor to make room for a wealthier or socially more acceptable class of tenants. Furthermore, in many instances the social, psychological, and historical ties to a neighborhood will override definitions of self interest in terms of economics or safety. Fifth, in order not to fall into the trap of rebuilding the community in accordance with an obsolete plan, public officials should develop fresh plans to guide rebuilding and relocation of facilities during both the post-prediction and post-quake periods. And sixth, because the threatened area will usually transcend civil boundaries, and because there will be changes in office holders during the course of long-term predictions, program continuity will depend upon bringing into the planning process both intragovernmental agencies (such as building and planning departments) and interjurisdictional organizations (such as the Association of Bay Area Governments in California).

Both the practical and political obstacles to developing and implementing an effective response to earthquake prediction will be especially great in areas such as the eastern seaboard and Missouri Valley, where the risk of a serious earthquake appears to be substantial but popular and governmental awareness of the risk is low. However, with few structures in these regions designed to be quake-resistant, the potential saving of lives as a result of a program to get people safely away from most buildings at the time of the quake could also be much greater than we anticipate in California where many structures will withstand most earthquakes.

CONCLUSIONS AND RECOMMENDATIONS [4]

From the many recommendations scattered throughout the Report, the Panel selected a few to be highlighted as major recommendations. These recommendations will be presented, along with a brief statement of the associated conclusions whenever they are not quite obvious from earlier discussion in this article. In a separate chapter, the Panel also enumerated a series of specific measures that might be employed as part of a constructive response to the prediction. The most significant of these will be mentioned in connection with the relevant major recommendation.

Prediction in Earthquake Hazard Mitigation

The prospects for saving lives on the basis of an earthquake prediction are much clearer at this time than the prospects for substantial reduction in property loss. In years to come, as experience enables us to establish legal precedents and legislation to facilitate prompt and effective action, and as uncertainties of economic response are resolved, the savings of property and income compared with the costs of an unpredicted quake may be substantial. But for the first prediction of a potentially destructive earthquake it is difficult to estimate the ratio of savings to costs. Under the worst combination of an inaccurate prediction and an ill-conceived public response, the prediction and quake together might even be more costly than an unpredicted quake would have been. By contrast, we know that lives can be saved if we make sure that people are located at safe distances from vulnerable buildings and other structures and are also protected against such derivative dangers as fire when the quake occurs. We know, too, that the saving in lives may in some instances number in the thousands. Because of the real danger that preoccupation with immediate economic costs could prevent people from undertaking and supporting programs that might save thousands of lives, the Panel offered its first recommendation:

Recommendation 1

The highest priority in responding to earthquake prediction should be assigned to saving lives, with secondary attention to minimizing social and economic disruption and property loss, provided the costs are within the limits that society is willing to accept.

Both the consequences of most specific measures and the practical possibilities for putting them into effect are quite uncertain at present. Much will depend upon: (a) private-sector decisions by national business leaders; (b) whether legislation and laws facilitate or impede constructive response; and (c) the stability of the political base for local public officials. Hence, any effort to follow a rigidly prescribed plan for responding to earthquake warning will surely lead the community into a deepening morass of problems. The more effective approach will be to work from a catalogue of specific measures, applied selectively and flexibly according to the local situation, with careful monitoring for effectiveness and for changing conditions.

The more people live, work, study, and play in earthquake-resistant structures, and the more consistently community planners and other public and private officials have taken prior account of earthquake danger, the more manageable will be the tasks to be undertaken when a quake is predicted. As the Panel examined recommended measures to be taken in response to a prediction, it was constantly reminded that a constructive program for utilizing earthquake prediction builds on and supplements a long-term program of planning for earthquakes. Accordingly, the Panel recommends:

Recommendation 2

Prediction should be used in conjunction with a complete program of earthquake-hazard reduction, and not as a substitute for any of the procedures in current use.

Because of the infrequency of earthquakes of destructive magnitude within any one locality in the United States, an agency established exclusively to cope with earthquake predictions would surely stagnate and suffer reduced funding during intervals between serious quakes. Because of anticipated long periods of advance warning, many of the tasks of responding to earthquake predictions will fall within the province of departments of planning, building and safety, and engineering and public works, rather than the police, civil defense units, and other agencies most concerned with emergency mobilization. Consequently, the Panel recommends a substantial reorientation of thinking and authority for coordinating response to earthquake warnings as compared with other disaster warnings:

Recommendation 3

The primary responsibility for planning and responding to earthquake predictions should be assigned to federal, state, local, and private agencies having broad concern for community and economic planning and for disaster preparedness and response, rather than to newly formed agencies established especially to deal with earthquake prediction and warning, or to agencies concerned primarily with emergency response.

If we are to make constructive use of the prediction capability, we shall need advance clarification of the many legal uncertainties that have already been discussed. In particular we shall need to insure that existing federal disaster relief provisions can be applied immediately when an earthquake warning is issued. The Panel made two recommendations:

Recommendation 4

As an essential feature of advance planning, legal determinations and clarifying legislation should be sought to minimize the legal ambi-

guities that otherwise will hamper officials in making constructive response to earthquake prediction.

Recommendation 5

Legal inquiry should be undertaken to clarify what powers for responding to earthquake predictions now exist under the Disaster Relief Act of 1974 (PL 93-288), and what further powers might be necessary. Any deficiency or uncertainty regarding application to the emergency created by prediction of a potentially destructive earthquake should be promptly corrected by new legislation.

In response to the pervasive problem of equity, the Panel recommends:

Recommendation 6

A public agency should be assigned the responsibility to (a) identify groups of people most likely to need special assistance in the event of an earthquake or to suffer disproportionate loss and disruption when an earthquake is predicted, (b) develop a plan to offset, insofar as is practicable, the inequitable costs and suffering attendant on both the quake and the prediction, (c) monitor events after the prediction from the point of view of equity, and (d) help unorganized population segments to recognize how the earthquake prediction affects their interests.

Some of the urgent questions that will require intensive and continuing investigation are identified in a series of recommendations for research.

Research recommendation 1

High priority should be assigned to developing a standby anticipatory research capability to be utilized as future earthquake predictions are issued. The plan should include comprehensive examination of the social, economic, legal, and political effects of the prediction and of the actual quake.

Research recommendation 2

Socioeconomic monitoring should be established concurrently with geophysical monitoring in order to develop baseline data and methodology, to serve as a standard for measuring the social, political, and economic impact of earthquake prediction, and to refine techniques that can be applied to other regions as the geophysical monitoring networks are expanded.

Research recommendation 3

Continuing investigation should be made of experiences in utilizing earthquake prediction in countries such as Japan, the Soviet Union, and China, and of the effects of introducing prediction technology in other countries such as developing nations where earthquake risk is high.

Research recommendation 4

A comprehensive study should be launched on the legal problems likely to be encountered as earthquake-prediction capabilities develop. Preparation of a compendium of federal and state laws pertaining to earthquake prediction and earthquake-mitigation measures would be a useful beginning.

Research recommendation 5

A comprehensive investigation should be conducted on the division of function and responsibility among the various levels of government and the interrelationships among government and private agencies whose efforts must be coordinated in connection with earthquake prediction and hazard mitigation.

Prediction and warning

The discussion of problems in issuing predictions has already sensitized the reader to a variety of dangers for public policy, including the following circumstances: predictions will develop incrementally and be subject to revision, and will not approach certainty within the foreseeable future; many people lack the background to understand predictions stated in probabilistic terms, or to distinguish scientifically authenticated predictions from those with no scientific basis; some groups stand to gain financially at the expense of others if they can secure inside information before a prediction is made known to the general public; many business leaders and public officials will be tempted to call for the suppression of predictions to forestall possible economic and political disruption; predictions that are withheld will almost certainly surface through unofficial channels, leading to public recrimination and distrust that will undermine cooperation in earthquake mitigation programs; delay in releasing predictions will reduce the time available to make orderly use of land use planning and strict building code enforcement to reduce the earthquake hazard. The Panel offered two recommendations:

Recommendation 7

Predictions should be developed, assessed, and issued to the public by scientists rather than by public officials. Procedures must be developed to ensure the free and timely flow of information concerning the prediction to all segments of the public. Legislation may be required to assure that information that an earthquake will occur at a given location and time will not be withheld from general knowledge to the advantage of special interests.

Recommendation 8

A designated federal agency should establish a group of governmental and non-governmental scientists who can be called upon to evaluate specific earthquake predictions. The responsibility for establishing this group should not be vested in any agency that is involved in the technical pursuit of earthquake prediction. This agency should also maintain a record of all published predictions.

While predictions are strictly technical matters, issuing and assessing warnings are peculiarly the responsibility of public officials acting in the interests of the people they represent. Because of the well-documented public disposition toward disbelief and inaction in the face of threatened danger, it is important that official warnings be announced in such fashion as to maximize credibility and readiness to cooperate. Past experience with other types of disaster indicates that public officials often delay issuing warnings with deleterious effects because of mistaken fears of mass panic and of a "crying wolf" effect in case of a false alarm. At present the responsibility for issuing such warnings is dangerously undefined, as among local, state, and federal government levels, and where several local jurisdictions are affected. The Panel concluded that ambiguities must be resolved before the occasion of the first prediction of a potentially destructive earthquake, and offered two recommendations concerning earthquake warnings:

Recommendation 9

A designated federal agency should confer promptly with governors of the principal earthquake-prone states or their representatives to clarify the respective responsibilities at each level of government and to establish procedures for issuing earthquake warnings.

Recommendation 10

A warning should be issued by elected officials promptly after a credible prediction of a potentially destructive earthquake has been

authenticated. A warning should include a frank assessment of the prediction, noting the possibilities for error, information on the types and extent of damage that the earthquake could cause, a statement concerning plans being developed to prepare for the quake, and advice concerning appropriate action to be taken by individuals and organizations.

Warnings are of little value unless they are both received and understood by all segments of the population. Based on changing predictions and on the pattern of public response, warnings must be periodically reviewed, reaffirmed, and revised. The Panel recommends:

Recommendation 11

A designated federal agency should establish mechanisms for monitoring public understanding, credence, and response at all stages of the prediction-warning-earthquake sequence, and for making this information available promptly to responsible public officials.

Recommendation 12

Careful attention should be paid to the problems of communicating to segments of the population that might otherwise only receive last-minute warnings belatedly. These segments include such groups as foreign-speaking minorities, the physically handicapped, tourists, and the socially isolated.

Again, there is much to be known about public reception and understanding of earthquake predictions and warnings that can only be learned by a well considered program of research:

Research recommendation 6

Circumstances influencing the credibility of earthquake predictions and warnings, and techniques for improving their credibility, need more careful study.

Research recommendation 7

Research is needed on how people process information regarding low-probability disasters and how this processing changes when a prediction alters the probability. It is important to gain more understanding of how people establish acceptable levels of risk in such instances.

Research recommendation 8

Popular perceptions and understandings of earthquakes and earthquake prediction should be investigated, comparing populations in different earthquake-prone regions of the United States and among people who have experienced severe quakes, minor quakes, and those who have no previous experience with earthquakes.

Hazard-Reduction Measures

The prospect of substantially reducing the earthquake hazard on the basis of a prediction will be greatest when there is a plan in readiness before a prediction is made and when the plan is part of a continuing program of hazard reduction. The Panel recommends:

Recommendation 13

As part of a complete and continuing earthquake mitigation program, each earthquake-vulnerable community should develop a hazard-reduction program, involving both public and private agencies, to be placed in effect in case of an earthquake warning. A designated federal agency should establish a central clearing house to provide the necessary hazard-reduction information and technical assistance to states, which in turn will aid communities in developing their plans and in implementing them.

Unlike floods, hurricanes, and tornadoes, earthquakes would seldom be lethal were it not for the structures humans build that cannot withstand violent earth movement. Hence, the

principal focus for hazard-reduction strategy is dealing with earthquake-vulnerable structures. With long-term predictions this means emphasis on land-use management and on structural-design and -maintenance programs. In the short term it means vacating dangerous structures and guarding against special hazards such as fire. In any particular situation the period of advance warning, length of the prediction time-window, concentration of population, economic costs, legal constraints, and credence placed in the prediction will all affect the possibilities for action. Responsible public and private leaders will have to determine the most effective combination of measures in each instance. But the Panel agreed that a basic set of measures merited consideration in each case, and made the following recommendation:

Recommendation 14

Each threatened community should examine the applicability of each of the following major kinds of hazard-reduction measures: (a) evacuating limited areas and vacating dangerous structures; (b) accelerating structural-design and -maintenance programs; (c) employing land-use planning and management powers in relation to the predicted locale of the quake; (d) protecting essential natural gas and other community lifelines; (e) dealing with such possible hazards as nuclear plants, vulnerable dams, highly flammable structures and natural cover, and facilities involving the risk of explosion and the release of dangerous chemicals.

More specific illustrations of the steps envisaged under each of these headings will be briefly suggested.

(a) Massive evacuation will rarely be an acceptable strategy because of the crippling effect on the threatened community, the difficulty in locating suitable host communities, the demoralizing consequences of separating family members and removing dependent people from familiar surroundings at a time of stress, and the many direct costs incurred in the evacuation process. But *selective evacuation* and systematic *vacating* of unsafe structures will be essential in dealing with tsunami and landslide hazards, and with unsafe structures and inappropriate land use that remain after all practicable corrective steps have been taken. With one or several years of advance warning, a careful study could be initiated to identify areas and structures where hazards cannot be suitably reduced by other means, and evacuation plans could be developed for these locations. With less than a year of advance warning, evacuation plans could be applied to more obviously dangerous localities, such as areas downstream from potentially unsafe dams, areas susceptible to unmanageable fire, and areas especially vulnerable because of proximity to the predicted point of impact. All of these steps can be executed more effectively if communities begin now to conduct feasibility studies of alternative plans for selective evacuation.

(b) The aim of structural design and maintenance is to insure that all buildings occupied by human beings and structures such as bridges and towers that might collapse on passers-by are built to conform with acceptable standards of earthquake resistance. The special value of an earthquake prediction is to permit accelerated application of these standards within the targeted area. The slow and costly process of bringing all structures up to a reasonable standard of safety can be accelerated within the area of greatest danger. With a year or more of advance warning, a comprehensive program could be launched, to include such steps as the following: building codes can be reassessed in relation to the anticipated magnitude of the quake; critical structures can be identified, their safety assessed, and either brought up to standard or the critical activities relocated; a public agency can be designated to advise owners of noncritical structures concerning the vulnerability of these structures to the predicted quake, and assist them in bringing the structures up to standard or in some cases demolishing them and relocat-

ing the activities; regulations and procedures can be adopted to insure that relatively safe structures are not allowed to deteriorate, and that seismic-risk analyses are required for transfering ownership of certain categories of property in the threatened area. With less than a year's warning, limited strengthening and demolition of vulnerable structures might still be undertaken, and hazardous and valuable materials could be transferred from unsafe structures. Again, communities that start now to accumulate and maintain up-dated information on the seismic resistance of critical structures and to develop contingency plans for responding to any earthquake prediction will be in the most favorable position when an earthquake prediction is issued.

(c) The effectiveness of land-use planning depends upon being able to pinpoint specific zones of relative safety and danger. The earthquake prediction adds significant new information concerning places of greatest risk. When the period of advance warning is long enough, revised planning for hazard reduction is made possible. With a year or more of advance warning, and a favorable political climate, several steps might be taken: detailed earthquake hazard maps, modified to reflect the prediction, can be made generally available; existing land-use plans can be promptly modified, and existing land use reassessed in relation to the new information; special attention can be devoted to removing, replacing, or strengthening vulnerable lifeline elements in high-risk locations; taxation and other powers might be used to encourage desirable modifications in land use; plans should be developed for appropriate land use after the earthquake. With less than a year's warning, existing land-use information or a quick survey could be used to identify relatively safe and dangerous locations. The most constructive response will be possible when communities have already identified earthquake-related land-use problems, when potential problems from lifeline units have been identified at a state level and contingency plans developed, and when federal study of land-use planning and management in areas of high and moderate earthquake risk has created resources for the assistance of local communities.

(d and e) Each community will have unique hazards to deal with. One community will be dependent on an aqueduct for its water supply, one will be bordered by inflammable brush land, and one will house a plant where toxic chemicals are manufactured. Many of these hazards will be under private or state or federal control, so that local officials must depend upon voluntary cooperation. With either long or short periods of warning, a variety of steps can be taken wherever they are appropriate to the local situation: natural gas and petroleum pipe lines and incompressible fluid lines can be shut down; traffic can be diverted from vulnerable bridges and underpasses and vulnerable stretches of subway lines closed; reservoirs can be lowered behind vulnerable dams; firebreaks can be created and other steps taken to lessen fire hazard; protective measures can be taken against pollution hazards such as the rupture of sewage lines; supplies of fuel and hazardous chemicals in storage tanks can be reduced, and operations suspended in potentially dangerous factories and nuclear and hydroelectric power plants; ships can be cleared from harbors where there is a tsunami threat; departures from work can be rescheduled to avoid rush-hour bottleneck traffic. Each community, and all federal and state agencies and public utilities should start now to maintain an inventory of all special potentially hazardous facilities and make plans for dealing with them in case of an earthquake warning.

It should now be clear that an adequate hazard-reduction program will be expensive, though with effective planning the costs should be offset by reduced property loss and economic disruption from the actual quake. The Panel recommended:

Recommendation 15

It should be accepted policy on the part of public and private agencies that a considerable part of the financial assistance normally available to a community after an earthquake should be made available as needed for hazard-reduction measures taken in response to an authenticated prediction of a potentially destructive earthquake. New legislation should be enacted as required to achieve this end, taking into account the example of such existing legislation as PL 93-288, The Disaster Relief Act of 1974, especially Title IV, Section 417 of that Act on "Fire Suppression Grants."

Many of the measures that seem most promising for earthquake hazard-reduction may prove difficult to implement or ineffective because of various social, political, economic, psychological, and legal considerations. The Panel was unable to reach a conclusion concerning the effectiveness of insurance as a way of spreading losses and providing incentives, through rate differentials, for investing in earthquake-resistant construction. Furthermore, assessment of the merits of various hazard-reduction measures depends upon having satisfactory ways to estimate the losses from future earthquakes, and understanding the complex decision-making interactions among public and private organizations and groups. Accordingly, the Panel recommended research into several crucial questions.

Research Recommendation 9

Intensive study is needed on the feasibility of implementing the hazard-reduction measures suggested in Recommendation 13 and on their probable effectiveness.

Research Recommendation 10

A thorough study is needed of the potential role of insurance as an approach to the problem of hazard reduction and of the political and economic implications of alternatives to the current system of voluntary earthquake insurance.

Research Recommendation 11

Research should be conducted on refining the theory and method of estimating losses from future earthquakes and on comparing the benefits and costs of various alternative hazard-reduction measures.

Research Recommendation 12

Several prototype economic models for earthquake-prone regions should be developed for estimating the dynamic interactions among the public sector, businesses, and households, assuming alternative earthquake-warning sequences.

Readying Emergency Services

There is much accumulated experience with emergency planning at local, state and federal levels. But earthquake planning is generally based on the assumption that the quake will occur without advance warning. Both public and private agencies should be able to use the period between warning and quake to prepare their personnel and facilities for the response to the earthquake when it comes. Anticipating the location and magnitude of the quake should be especially helpful to agencies in planning the most effective emergency response.

Recommendation 16

Emergency plans in earthquake-vulnerable areas should be revised to include programs for readying emergency services in the interval between warning and quake.

Emergency response is the phase of earthquake preparation most easily understandable

to the layman and most suitable for large-scale citizen involvement. With careful planning, such involvement can help to upgrade the effectiveness of the community's response when the quake occurs, to enhance the credibility of the prediction by involving people in readily understandable action, and to augment public support for some of the less popular but essential measures in preparing the community for the earthquake.

Recommendation 17

Emergency plans should include programs for broad and active citizen involvement in preparing for the earthquake.

Dealing with Counterproductive Consequences of Prediction

Evidence from other threatening situations suggests that most inhabitants of an area will attempt to continue life as usual, but the foundation of the regional or local economy may be significantly influenced. If mortgages, insurance, and investment are limited in the threatened area and even a small but significant outmigration occurs, rising unemployment, falling property values, and reduced community tax revenue will become problems for the community. The Panel could neither estimate the extent of such possible economic disruption nor specify the precise techniques for dealing with it, but recommended instead:

Recommendation 18

Upon issuance of an earthquake warning a joint governmental and private-sector commission should be established to monitor the economy in the threatened area to ensure early detection of changes, and make recommendations to government, business, and labor organizations as needed. Representatives of insurance and investment organizations should be included and should play an integral part in the work of the commission.

Underlying all policy discussions will be the general question of whether to sustain the community or to allow and encourage an orderly outflow of capital and population. There is danger that mutually contradictory plans may be developed if this issue is not addressed directly and resolved unambiguously.

Recommendation 19

In the event of a credible earthquake prediction, policy-makers must continuously weigh the relative merits of sustaining the economy in the threatened area at its pre-warning level or of encouraging some orderly outflow of capital. Economic subsidies may be required either to sustain the economy or to protect groups of people who would otherwise suffer undue hardship as a consequence of economic dislocation resulting from the prediction and warning.

As services regarding earthquake mitigation are offered to the public by businesses and individuals, steps may be required to protect the public against unscrupulous opportunists.

Recommendation 20

Consideration should be given to the development of standards to govern the practices of businesses and individuals offering services to the public regarding earthquake mitigation.

The need for more information on which public officials can base their actions is especially acute with respect to the economic response.

Research recommendation 13

Research is needed on the probable decisions affecting the economy of the threatened area made by both local and national business and financial leaders and the various economic interactions that are likely to result from these decisions.

Research recommendation 14

The likely effects of earthquake predictions on how various kinds of markets process information and discount changes in the size and timing of losses should be studied in depth. Special attention should be focused on markets for securities (public and private), land markets, financial institutions, insurance practices, metropolitan and local public finance, and problems of financing and maintaining public utility operation.

NOTES

1 This article is a summary of *Earthquake Prediction and Public Policy*, prepared for *Mass Emergencies* by the Chairman of the Panel on Public Policy Implications of Earthquake Prediction, Advisory Committee on Emergency Planning, Commission on Sociotechnical Systems, National Research Council – National Academy of Sciences. Although the summary expresses the author's interpretations and judgments of what is more and less important in the report, it makes liberal use of actual words and sentences from the report. Both the substance and the writing of the Panel's report are the product of collective effort. William A. Anderson, James M. Brown, C. Martin Duke, Charles E. Fritz, Jerome W. Milliman, E.L. Quarantelli, Robert H. Simpson, H.R. Temple, and Ralph H. Turner all wrote portions of the report, and Sarah Osgood Brooks contributed extensive editorial revision. Others whose ideas have been incorporated in the report include J. Eugene Haas, Robert M. Hamilton, Howard C. Kunreuther, James F. Lander, Arnold J. Meltsner, Ugo Morelli, Richard Park, Robert E. Schnabel, Stanley Scott, Karl V. Steinbrugge, Charles C. Thiel, Jr., Robert E. Wallace, Robert Warren, and Alan J. Wyner. Ernst Weber made helpful comments on the draft of this article.

The complete report is available in a 151-page paperbound edition for $6.50 from the Printing and Publishing Office, Dept. JH 726, National Academy of Sciences, 2101 Constitution Avenue, Washington, D.C. 20418. A check or money order must accompany all orders unless a bona fide purchase order is enclosed. Purchase orders of $7.50 or less must be accompanied by a check or money order.

2 The economic analysis of which this section is a summary was uniquely the work of Jerome W. Milliman, who received consultation and advice from Howard Kunreuther and Karl Steinbrugge.

3 The legal analysis in the original report was prepared by James M. Brown.

4 Conclusions and recommendations are uniquely applicable to the situation in the United States and will often require modification to fit the circumstances in other countries.

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FAMILIES IN DISASTER: PATTERNS OF RECOVERY*

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INTRODUCTION

On June 8, 1966, a violent tornado struck Topeka, Kansas. The tornado killed 17 persons, injured 550 and left 1600 families homeless; property damage was estimated at 100 million dollars (Taylor et al., 1970). How do victims of such a disaster recover? Who helps victims in such events? What kinds of resources do victim families possess to aid their recovery? Questions like these must be answered if we wish to understand the process of recovery through which victims seek to restore order and stability to their lives.

Literature in the area of altruism has sought to understand the conditions, motivation for, and variations in the emergence of "positive forms of social behavior" (Gouldner, 1960; Wispe, 1972; Midlarsky, 1968). Helping behavior has been viewed as a form or component of altruistic behavior in which there is "giving of assistance or aid toward a definite object or end" (Wispe, 1972: 4). Disaster events have been viewed as a time when there is a great outpouring of generous, heroic and selfless activity. The emergence of "therapeutic communities" as Fritz (1957; 1961) labelled this phenomenon has been documented widely (e.g., Fritz and Mathewson, 1957; Quarantelli, 1960a; and Dynes, 1970). Barton (1969: 216–279) has proposed numerous hypotheses which specify variations in the speed and extensiveness of these "altruistic communities." Yet we still lack much understanding of variations in help received by victim families. Furthermore, though one source of help in recovery lies in help received from others, victims also possess some degree of internal resources which facilitate this process. Hence recovery after a disaster event can be viewed as mediated both by help from others and victim's own internal resources.

Following the 1966 tornado, the Topeka community rapidly responded in accordance with the prediction that researchers like Fritz (1961), Barton (1969) or Quarantelli and Dynes (1972) might offer. Taylor et al. (1970) have prepared a detailed account of the rise and gradual demise of an emergent "therapeutic community" as individuals throughout Topeka and its environs sought to help the 1600 who were left homeless and the thousands of others who incurred less severe losses.

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In this paper we will focus on a sample of victim families of this disaster and present a description of recovery patterns by examining both help extended to them by external groups and resources possessed by victim families. Upon examining help from external groups, we sought to ascertain which groups gave victims assistance, the kinds of help given to victims and the method in which help was obtained. In contrast to these questions about help from external groups, we also explored the recovery of victims through the utilization of internal family resources such as house insurance, car insurance, savings, etc. Finally, recognizing that some families received more help and possessed and utilized more resources than others, we sought to account for this variation.

METHODOLOGY

During 1969 and 1970, interviews were conducted with 338 families who suffered losses through the tornado which occurred in Topeka, June 8, 1966. These interviews were conducted within the context of a larger study in which we sought to assess the long-term impact of this event on family functioning (Drabek et al., 1973). These families varied in degree of loss and were classified into two groups: (1) moderate damage, e.g., a few broken windows and debris in the yard and (2) extensive damage, e.g., personal injury or major damage to their house or car [1].

This sample of victims was drawn in accordance with the quasi-experimental design used in the larger study. Reflecting the design requirements of this study in which pre- and post-tornado family functioning was assessed, the victim sample came from four sources: (1) respondents from an Urban Renewal Family Relocation Study conducted through the years 1962–1964 (Key, 1967); (2) interviewees in an Office of Economic Opportunity Study conducted during the years 1965–1966 (Taylor et al., 1966); (3) families residing in the four Topeka census tracts with the lowest socioeconomic ranking which were located in the path of the tornado [2]; and (4) families residing in the four census tracts with the highest socioeconomic ranking, which were also located in the tornado path. The UR sample, OEO sample and sample drawn from the low income census tracts were combined for analysis purposes and are referred to in the paper as "the low income group" (N = 238). The remainder of the sample (N = 100) will be designated as "the higher income group" [3].

Respondents were interviewed and asked about the impact of the tornado and sources of recovery used by the family [4]. These data served as the basis for our analyses. Following a discussion of help obtained from external groups, we will present an analysis of the internal resources of victim families.

VARIATIONS IN EXTERNAL HELP SOURCES

Previous disaster research suggests that there are a variety of external groups which give aid to victims. The important role of kin and friends during the recovery period has been documented (Quarantelli, 1960b; Midlarsky, 1968; Hill and Hansen, 1962). Assistance from official agencies, e.g., American Red Cross, the Salvation Army and many ephemeral groups which emerge after most disasters has also been established (Moore, 1958; Barton, 1969; Dynes, 1970). Research also indicates that victims often prefer receiving help from kin, friends and those who appear to be acting on their behalf spontaneously, and may often reject help channelled through bureaucratic agencies. Midlarsky (1968), in interpreting these findings, suggests that the individual in need of help experiences feelings of helplessness and despair and is sensitive to the behavior of those who are in a position to help him. Victims are likely to wonder about the helper's motives and if reciprocity is expected. If those offering help act freely, then the recipient feels free to express his gratitude in his own way (Midlarsky, 1968: 240).

Our concern in this study was to not only ask victim families about the help they received from kin, friends, the Red Cross and Salvation Army, but also to ascertain whether help was received from other help sources which we thought would be important during this period. Hence we also asked victims if they had received help from religious organizations, governmental agencies, strangers and employers. In asking victim families about the sources from which they received help, our purpose was to ascertain: (1) how many victims received some type of help from an external source; (2) variation in the amount of help received; i.e., did some victims receive help from more sources than others; and (3) whether some sources overall gave help more frequently than other sources.

Our data supports previous research which indicates that the time following a disaster is characterized by an outpouring of help to victims. Most (77%) families indicated that they received assistance from at least one of the help sources listed. Over half (58%) reported that they were aided by two or more external groups. The important role of kin during this time as a source of help is also substantiated by our data. Relatives were the most frequent source of help reported; over half (54%) of all victim families received help from kin. Friends, religious organizations and the Red Cross were also frequently mentioned (43%, 32%, 33%, respectively, see Table I). The five remaining sources gave help much less frequently.

In ascertaining what could account for these variations, we suspected that there would be a relationship between the amount of help received and the method in which victims received that help; i.e., were they offered help or did they have to ask for it, Our data indicated that nearly all help was offered, not requested. Note the variations presented in Table II. Thus, the impressionist evidence of "the therapeutic community" that has been reported by many (Fritz and Mathewson, 1957; Taylor et al., 1970; Barton, 1969) is supported by these data. By and large, victims do not go out looking for help. Rather they are bombarded with offers from many different types of sources.

Yet, why were some victims offered help while others were not? We felt that the helper's view of the victim in terms of the degree of damage experienced by the victim would be important. If help sources "perceived" certain victims as having extensive amounts of damage then these victims may have received more

TABLE I

Sources of Aid Reported by Victim Families*

Source of Aid	Families Who Received Help	Families Who Did Not Receive Help
Relatives	54 (181)	46 (157)
Friends	43 (146)	57 (192)
Religious Organizations	32 (108)	68 (230)
Red Cross	33 (113)	67 (225)
Salvation Army	21 (72)	79 (266)
Voluntary Organizations	12 (42)	88 (296)
Governmental Agencies	13 (44)	87 (304)
Strangers	13 (44)	87 (304)
Employer	15 (50)	85 (304)
Total Number Reported	800	2,278

*Numbers listed are percentages; corresponding N's are included in parentheses.

TABLE II

Frequency of How Help was Received by Victims*

Help Source	Help Offered	Help Asked For	Joint Decision
Relatives	92 (164)	0 (0)	8 (14)
Friends	95 (127)	2 (3)	2 (3)
Religious Organizations	95 (106)	2 (2)	3 (4)
Red Cross	66 (72)	30 (33)	4 (4)
Salvation Army	78 (56)	19 (14)	3 (2)
Voluntary Organizations	86 (37)	12 (5)	2 (1)
Governmental Agencies	81 (35)	12 (5)	7 (3)
Strangers	100 (41)	0 (0)	0 (0)
Employer	92 (43)	6 (3)	2 (1)
Total Reported	88 (681)	8 (65)	4 (32)

*Numbers listed are percentages; corresponding N's are included in parentheses.

TABLE III

Frequency of Amount of Help Received by Victims by Degree of Damage Incurred*

Help Source**	Degree of Damage		X^2	df	*p*
	Extensive	Moderate			
Relatives	62 (161)	25 (20)	33.04	1	.001
Friends	52 (135)	14 (11)	36.00	1	.001
Religious Organizations	38 (97)	13 (10)	17.20	1	.001
Red Cross	39 (100)	17 (13)	13.35	1	.001
Salvation Army	23 (60)	15 (12)	2.23	1	N.S.
Voluntary Organizations	13 (33)	10 (8)	0.04	1	N.S.
Governmental Agencies	16 (42)	4 (2)	10.01	1	.01
Strangers	16 (42)	4 (2)	10.01	1	.01
Employer	19 (50)	4 (2)	13.08	1	.001

*Numbers listed are percentages, corresponding N's are included in parentheses.
**Numbers and percent listed refer to those victims who received help.

offers of help. Our data indicated that when help was received, victims who suffered extensive damage were more likely to have received it than victims who suffered only moderate damage (see Table III). Nearly two-thirds (62%) of the victims who suffered extensive damage received help from relatives, whole only one-fourth (25%) of the victims who suffered moderate damage did so. The other help sources reflected a similar trend. Victims who suffered extensive damage are therefore more likely to receive help than those who suffered moderate damage.

Yet many of those who suffered extensive damage did not receive help from particular help sources. Thus other factors, in addition to degree of damage, must be included in any effort at explanation.

Given socioeconomic variations in life styles (Roach, 1967; Roach et al., 1969), intensities of kin involvement (Reiss, 1962; Troll, 1971; Klatzky, 1973), and community participation rates (Dotson, 1951; Greer, 1956; Litwak and Szeleny, 1969), that have been documented in other communities, it appeared likely that variations in disaster assistance received might have followed a similar pattern. For example, we expected that a smaller proportion of high income families would receive aid from relatives and friends than those with low income. In discussing the relationship between socioeconomic position and helping behavior, Midlarsky points to evidence indicating that altruistic motivation is more likely to be found among the lower classes than among either the middle or upper classes. Middle class individuals are more apt to expect reciprocity for helping while lower classes are more likely to demonstrate modified altruism; that is, they give help in a crisis if they possess a particular skill or expertise (Midlarsky, 1968; 237–238). We also expected that lower income families might retreat from offers made by organizational officials. Thus, we contrasted the high and low income samples controlling on intensity of damage.

Our analysis indicated that among victims who suffered extensive damage, socioeconomic status made little difference for three help sources, i.e., the Salvation Army, voluntary organizations, and employers (see Table IV). However, a higher proportion of families within the high income sample received help from relatives, friends, governmental agencies and strangers. Families within the low income sample more frequently received help from religious organizations and the Red Cross.

TABLE IV

Frequency of Victims who Incurred Extensive Damage and Received Help by Sample*

	Help Source**								
Criterion Group	Relatives	Friends	Religious Organizations	Red Cross	Salvation Army	Voluntary Organizations	Governmental Agencies	Strangers	Employer
Low Income	58 (98)	44 (74)	42 (72)	44 (75)	24 (41)	8 (14)	11 (19)	11 (18)	16 (17)
Higher Income	70 (63)	69 (61)	28 (25)	28 (25)	21 (19)	21 (19)	26 (23)	27 (24)	25 (23)
X^2	4.29	14.64	5.07	6.33	0.25	0.03	9.25	11.53	2.97
	d.f. = 1	d.f. = 1	d.f. = 1	d.f. = 1	d.f. = 1	d.f. = 1	d.f. = 1	d.f. = 1	d.f. = 1
	$p < .05$	$p < .001$	$p < .05$	$p < .02$	p = n.s.	p = n.s.	$p < .001$	$p < .001$	p = n.s.

*Numbers listed are percentages; corresponding N's are included in parentheses.
**Numbers and percent listed refer to those victims who received help.

Interpretation of these findings led us to examine characteristics of Topeka as a community and this particular disaster event which might explain these differences in helping patterns for the low income and high income samples. For example, within the high income sample, many who received assistance from governmental agencies indicated that this help was provided by the National Guard. This organization, they recalled, had protected their homes and property against possible looting. In contrast, respondents within the low income sample rarely mentioned this agency as a help source. Thus, the variation concerning governmental agencies largely appeared to reflect either decisions made regarding placement of National Guard personnel following the event or variations in recall and awareness by persons within these two income categories. Likewise, it appeared likely that "strangers" might have been selective in terms of the "areas" in which they would venture to offer help. Note the higher percentage reported by families within the high income group. Relatives and friends of higher income victims perhaps gave help more frequently because they had more resources (e.g., an extra bedroom, extra food and clothing). In addition most of our victim families had been long-term residents of the city. For example, eighty-four percent had lived in Topeka at least since 1960. Such long-term residency was less true among families in our high income samples – over one-fourth (28%) had lived elsewhere in the ten years prior to the past tornado interview in contrast to the low income sample wherein only 8% had lived in some other city during the same time period. However, the overall residential stability of the high income sample together with the probability of greater resources of friends and relatives of this group can perhaps account for more help being given to them than the lower income sample. The variation in aid received from religious organizations was in large part due to the emergence of a major ephemeral organization that was established in a church located near to the homes of many low income victims. Hence the ecological location of this one transitory organization of disaster-relief workers appeared to be important in determining whether or not help was received from this source. Finally, low income families may have been more likely to accept offers of help from the Red Cross because kin and friends were not offering help.

In brief, socioeconomic status did make a difference in the pattern of assistance received, although not in the directions that we expected. Greater proportions of victims with higher incomes were assisted by relatives, friends, strangers and members of governmental agencies. In contrast, lower income families

TABLE V

Frequency of Low Income Victims who Received Help by Race*

	Help Source								
Race	Relatives	Friends	Religious Organizations	Red Cross	Salvation Army	Voluntary Organizations	Governmental Agencies	Strangers	Employer
Whites	55	40	33	26	16	7	9	9	10
	(74)	(54)	(44)	(35)	(22)	(10)	(12)	(12)	(13)
Non-Whites	39	28	36	50	30	12	9	7	14
	(41)	(29)	(37)	(52)	(31)	(12)	(9)	(7)	(15)
X^2	5.53	3.97	0.19	14.40	6.06	1.16	0.01	0.04	1.26
	d.f. = 1	d.f. = 1	d.f. = 1	d.f. = 1	d.f. = 1	d.f. = 1	d.f. = 1	d.f. = 1	d.f. = 1
	$p < .02$	$p < .05$	p = n.s.	$p < .001$	$p < .02$	p = n.s.	p = n.s.	p = n.s.	p = n.s.

*Figures listed are percentages of low income victims who did receive help, by race – corresponding N's are included in parentheses.

more often were aided by Red Cross workers, and persons they associated with religious organizations.

A further concern of our analysis centered about ascertaining variations in recovery patterns by race. Would whites be more likely to receive more help than non-whites? Would certain help sources be more likely to offer help to whites than non-whites? While our higher income sample was exclusively composed of white respondents, fourty-four percent of our low income sample (N = 104) were non-whites. Analysis of this sample of respondents revealed several important patterns of racial variation in help received from external sources. No significant differences were found in the help obtained by whites and non-whites from religious organizations, voluntary organizations, governmental agencies, strangers and employers (see Table V). However, whites received significantly more help than non-whites from relatives and friends. Non-whites received more help from religious organizations and the Red Cross. Research in the area of "wealth accumulation" of whites and non-whites reports that across all class levels non-whites possess significantly fewer resources than whites (Terrel, 1971). Hence, friends and relatives of non-white low income victims may have offered help less frequently because they did not have the resources that victims needed. Therefore, non-whites may have been more likely to accept offers of help from other agencies, e.g., the Red Cross and religious organizations.

Analysis of help received among differing age groups also revealed several patterns of variation within both the low and higher income samples Within the low income sample, older persons were more likely to receive less help from religious organizations, the Red Cross, and as would be expected, employers. Older persons in the higher income sample were also less likely to receive help from the Red Cross and employers. However, they also received significantly less help from relatives, friends, the Salvation Army, governmental agencies, strangers and voluntary organizations (see Table VI). Hence the emergent picture is that older victims with higher incomes generally received less help from external sources.

What Kinds of Help were Received from External Sources?

What kinds of help did victims receive? Did the type of help vary among different help sources? Certainly we would expect that victims would receive different kinds of help from close kin than they would from strangers. Data presented in Table VIII permitted pursuit

TABLE VI

Frequency of Low Income Victims who Received Help by Age*

	Help Source								
Age	Relatives	Friends	Religious Organizations	Red Cross	Salvation Army	Voluntary Organizations	Governmental Agencies	Strangers	Employer
39 or below	58	43	48	48	24	7	9	9	21
	(34)	(25)	(28)	(28)	(14)	(4)	(5)	(5)	(12)
40–59	36	27	33	41	27	10	10	10	12
	(36)	(24)	(30)	(37)	(24)	(9)	(9)	(9)	(11)
60 and above	49	34	27	24	17	7	8	5	7
	(44)	(31)	(24)	(22)	(15)	(6)	(7)	(5)	(6)
X^2	4.96	4.32	7.37	9.93	2.75	0.64	0.03	1.25	6.48
	d.f. = 2	d.f. = 2	d.f. = 2	d.f. = 2	d.f. = 2	d.f. = 2	d.f. = 2	d.f. = 2	d.f. = 2
	p = n.s.	p = n.s.	$p < .05$	$p < .01$	p = n.s.	p = n.s.	p = n.s.	p = n.s.	$p < .05$

*Figures listed are percentages of low income victims who received help by age of respondent; corresponding N's are included in parentheses.

TABLE VII

Frequency of Higher Income Victims who Received Help by Age*

	Help Source								
Age	Relatives	Friends	Religious Organizations	Red Cross	Salvation Army	Voluntary Organizations	Governmental Agencies	Strangers	Employer
39 or below	76	85	28	39	24	15	30	39	33
	(25)	(28)	(9)	(13)	(8)	(5)	(10)	(13)	(11)
40–59	68	65	26	32	23	32	32	26	26
	(21)	(20)	(8)	(10)	(7)	(11)	(11)	(8)	(8)
60 and above	55	42	28	8	11	11	6	11	8
	(20)	(15)	(10)	(3)	(4)	(4)	(2)	(4)	(3)
X^2	3.19	13.82	0.04	9.55	6.91	9.91	7.36	6.65	7.65
	d.f. = 2	d.f. = 2	d.f. = 2	d.f. = 2	d.f. = 2	d.f. = 2	d.f. = 2	d.f. = 2	d.f. = 2
	p = n.s.	$p < .001$	p = n.s.	$p < .01$	$p < .05$	$p < .01$	$p < .05$	$p < .05$	$p < .05$

*Numbers listed are percentages of high income victims who received help by age of respondent; corresponding N's are included in parentheses.

of these types of questions.

The type of help reported most frequently was, not surprisingly, the rendering of personal services. A close second was receipt of food and clothing. Both of these types of actions would be expected after such events. However, we were surprised that loans of money ranked third. Thus, at least one-fourth (26%) of these families borrowed money from one of the help sources listed. Providing shelter and items for the house were mentioned frequently, as would be anticipated. Other kinds of help were given, but much less frequently, as detailed in Table VIII.

Also, as is evident upon inspection of the table, the type of help offered varied greatly among the different help sources. For example, families who received help from relatives were given "major" kinds of help. Relatives most frequently provided: (1) shelter, (2) food and clothing, or (3) rendered personal services. Friends offered similar types of aid, with one

TABLE VIII

Kinds of Help Received by Victims by Specific Source of Help*

Source of Help	Transportation	Shelter	Food and clothing	Loaned money	Facilities	Personal services	Emotional support	Items for the house	Total
Relatives	40	671	11	9	23	32	27	8	
	(4)	(76)	(45)	(12)	(3)	(126)	(6)	(6)	24 (278)
Friends	20	20	13	11	15	26	27	10	
	(2)	(23)	(53)	(14)	(2)	(104)	(6)	(8)	18 (212)
Religious	10	2	18	21	8	11	0	14	
Organizations	(1)	(2)	(70)	(27)	(1)	(42)	(0)	(11)	13 (154)
Red Cross	0	2	23	27	31	4	5	39	
	(0)	(2)	(92)	(36)	(4)	(17)	(1)	(30)	16 (182)
Salvation Army	0	2	22	0	0	2	0	8	
	(0)	(2)	(85)	(0)	(0)	(6)	(0)	(6)	09 (99)
Voluntary	0	0	6	3	0	5	0	3	
Organizations	(0)	(0)	(23)	(4)	(0)	(21)	(0)	(2)	04 (50)
Governmental	0	3	3	4	8	7	0	1	
Agencies	(0)	(4)	(11)	(5)	(1)	(28)	(0)	(1)	04 (50)
Strangers	10	3	2	0	0	8	36	3	
	(1)	(4)	(6)	(0)	(0)	(32)	(8)	(2)	05 (53)
Employer	20	1	2	25	15	5	5	14	
	(2)	(1)	(10)	(33)	(2)	(18)	(1)	(11)	07 (78)
	01	10	34	11	01	34	02	07	
Total	(10)	(114)	(395)	(131)	(13)	(394)	(22)	(77)	

*Maximum possible number of mentions by each respondent is four; numbers listed are percentages; corresponding N's are included in parentheses.

important exception – they far less frequently provided shelter than did kin.

A similar pattern was found concerning kinds of help received from religious organizations. Again food and clothing and personal services were the most frequently mentioned kinds of help. But more victims reported that they received loans of money from this source (21%) than from either relatives or friends (9% and 11% respectively). Employers also provided a large proportion (25%) of the loans reported.

We expected that a somewhat different pattern would be reflected in help received from the Red Cross and the Salvation Army since they both are bureaucratic organizations with long traditions of disaster involvement. Furthermore, Taylor et al. (1970) noted that these bureaucratic organizations played a different role in this disaster situation. ". . . the ephemeral institutions were the major vehicle for immediate emergency help . . . it was only after the unique and short-term emergency was met that the bureaucratic organization could function and show its strength" (Taylor et al., 1970: 127).

Our data indicated that from both the Red Cross and the Salvation Army food and clothing were the most frequent kind of help received. But the Red Cross also reportedly loaned money to victims (28%) and provided items for the house (39%), whereas neither of these activities were reported with much frequency for the Salvation Army. Hence, while both organizations provided similar kinds of help (food and clothing), the Red Cross played a greater role in recovery through issuing financial grants and household items.

The remaining help sources provided similar kinds of help. Thus, voluntary organizations and governmental agencies most frequently

gave victims food and clothing and rendered personal services. Strangers and employers were more likely to render personal services when help was given, but as noted above, employers also loaned money to victims.

In light of the variety of help provided by these help sources, we were interested in ascertaining if victim families were satisfied with the help which was offered to them. We indirectly tapped this dimension by asking victims if they encountered any problems in receiving help from any of these external groups and would they turn to these help sources again if a similar event occurred.

Very few victims indicated that they encountered any problems in receiving help. Among all victims who received help from any of the nine sources listed (N = 800) there were only eight instances listed of any difficulties. Furthermore, victims overwhelmingly indicated they would turn to the same sources again if a similar event occurred. Only four percent of the victims who received help indicated they would not do so. This pattern was reflected for all nine sources of help. We concluded that these data clearly indicated that victims were satisfied with the help they received from these varied external groups.

VARIATIONS IN INTERNAL RESOURCES

While external groups primarily aided victims immediately after the tornado, the kinds and amounts of internal resources controlled by victims constrained and patterned their long-term recovery, especially for those who suffered extensive damage. For victims whose house, car and personal belongings were destroyed, car insurance, house insurance, credit rating, savings, etc., are critical factors in aiding their recovery. We therefore examined the types of resources possessed by victim families and variations in these resources by socio-economic position, race and age.

The interview schedule contained several questions about various family resources that might have existed prior to the tornado, such as types of insurance, credit and personal savings. Examination of these resources by sample indicated, as expected, that higher income families commanded greater amounts of internal resources than those with lower incomes (see Table IX). This held true for every type of internal resource about which we queried except one. Nearly all who owned homes reported some type of house insurance (95% – high income; 88% – low income). Most likely this reflects the requirement of lending institutions which want to protect their investment. For other types of insurance the differences were greater, as indicated in Table IX.

TABLE IX

Variations in Internal Resources by Sample*

Type of Internal Resource	Low Income	High Income	X^2
Life Insurance	77 (183)	89 (89)	6.57**
Hospital Insurance	71 (169)	93 (93)	19.54****
Car Insurance	75 (136)	93 (85)	13.73****
House Insurance	88 (165)	95 (71)	0.19
Personal Savings	42 (99)	79 (79)	39.52****
Credit	74 (176)	87 (87)	6.95***
Bank Credit	51 (121)	74 (74)	15.47****
Household Items Insurance	60 (142)	84 (84)	18.82****

*Figures listed are the percentages of the criterion group which reported possession of the resource; corresponding N's are included in the parentheses.

**$p < .05$

***$p < .01$

****$p < .001$

Analysis of the low income sample by race revealed several differences in the degree and type of internal resources possessed by whites and non-whites. Greater proportions of whites possessed every type of internal resource, with the exception of house insurance (see Table X). They were significantly more likely to have life insurance, hospital insurance, car insurance, personal savings, credit, bank credit, and household items insurance. Hence, the recovery capacity of whites, even within the low income

TABLE X

Variations in Internal Resource of Low Income Respondents by Race*

Race	Life insurance	Hospital insurance	Car insurance	House insurance	Personal savings	Credit	Bank credit	Household items insurance
Whites	83	76	67	73	51	81	57	67
	(112)	(102)	(89)	(98)	(69)	(108)	(76)	(90)
Non-Whites	68	64	45	67	28	65	43	50
	(71)	(67)	(47)	(67)	(30)	(68)	(45)	(52)
X^2	7.73	3.891	10.837	1.49	7.168	7.34	4.236	7.168
	d.f. = 1	d.f. = 1	d.f. = 1	d.f. = 1	d.f. = 1	d.f. = 1	d.f. = 1	d.f. = 1
	$p < .01$	$p < .05$	$p < .001$	p = n.s.	$p < .01$	$p < .01$	$p < .05$	$p < .01$

*Figures listed are percentages of low income respondents who possessed various internal resources by race of respondent; corresponding N's are included in parentheses.

sample, was far greater than for non-whites within that same sample. Again this supports previous research which has pointed to the greater resource base of whites, in comparison to non-whites across all class levels (Terrel, 1971).

Further analysis of the low income and higher income samples by age groups also revealed important patterns of variation in the amount and types of internal resources possessed by victims. For the low income sample no significant differences were found among the different age groups regarding types of internal resources, with the exception of personal savings. Here, significantly more older persons (those 60 and above) possessed savings (54%), while only thirty-seven percent of those below the age of 39, and thirty-one percent of those between the ages of 40 and 59 indicated that they had savings (see Table XI). Within the higher income sample, significantly fewer older persons indicated that they had life insurance, credit, and bank credit, but more reported that they had household items insurance (see Table XI). All those below the age of 39 reported that they had life insurance as did nearly all (96%) of those between the ages of forty to fifty-nine.

In terms of utilization of internal resources, our data indicates that of the victims who had the various types of resources, house insurance, household items insurance and car insurance were used most frequently and as would be expected victims who suffered extensive damage were significantly more likely to utilize these resources than victims who incurred moderate damage. Ninety percent of our victims who incurred extensive damage utilized their house insurance, while sixty-four percent of those who incurred moderate damage utilized this resource. Seventy-one percent of the victims who incurred extensive damage utilized household item insurance, while only six percent of those who incurred moderate damage utilized this resource. Finally, over half (55%) of the extensively damaged victims utilized their car insurance, while 40% of the moderately damaged victims did so.

Victims also reported little difficulty in the utilization of these resources; of the 686 possible mentions of problems (two for each possible source, for each victim) only fifty-five instances were reported. However, there was socioeconomic variation in difficulties encountered with the higher income sample reporting twice as many instances of problems than the lower income sample, i.e., 27% vs. 10%.

TABLE XI

Variations in Internal Resources of Low Income and High Income Respondents by Age*

	Life insurance		Hospital insurance		Car insurance		House insurance		Personal savings		Credit		Bank credit		Household items insurance	
Age	Low income	High income	Low income	High income	Low income	High income	Low income	High income	Low income	High income	Low income	High income	Low income	High income	Low income	High income
39 or below	79	100	70	96	63	87	62	63	37	69	72	90	51	84	55	69
	(46)	(33)	(41)	(32)	(37)	(29)	(36)	(21)	(22)	(23)	(42)	(30)	(30)	(28)	(32)	(23)
40–59	78	96	70	93	60	93	68	77	31	77	76	96	58	80	54	87
	(71)	(30)	(63)	(29)	(54)	(29)	(62)	(24)	(28)	(24)	(69)	(30)	(53)	(25)	(49)	(27)
60 and above	73	72	72	88	50	75	74	72	54	88	72	75	42	58	67	94
	(66)	(26)	(65)	(32)	(45)	(27)	(67)	(26)	(49)	(32)	(65)	(27)	(38)	(21)	(61)	(34)
X^2	1.03	16.34	0.11	1.75	3.22	4.82	2.43	0.46	10.18	3.89	0.55	7.65	5.03	7.32	3.97	8.17
	d.f. = 2	d.f. = 2	d.f. = 2	d.f. = 2	d.f. = 2	d.f. = 2	d.f. = 2	d.f. = 2	d.f. = 2	d.f. = 2	d.f. = 2	d.f. = 2	d.f. = 2	d.f. = 2	d.f. = 2	d.f. = 2
	p = n.s.	$p < .001$	p = n.s.	p = n.s.	p = n.s.	p = n.s.	p = n.s.	p = n.s.	$p < .01$	p = n.s.	p = n.s.	$p < .05$	p = n.s.	$p < .05$	p = n.s.	$p < .02$

*Numbers listed are percentages of low and high income victims who possessed various internal resources by age of respondent; corresponding N's are included in parentheses.

SUMMARY AND CONCLUSION

We began by asking a rather simple question, but one which we know relatively little about – how do victims of a disaster recover? Our research confirms and extends observations made by previous researchers who have rated the emergence of a "Utopian mood" following large scale disasters in American communities (Fritz and Mathewson, 1957; Barton, 1969; Dynes, 1970). Many victims reported during our interviews that they were surprised at the amount of help and offers of help they received. Thus, three years after the event, this aspect remained an overwhelming part of their memories. But this point has further implications for future theory. Participation in the "Utopian mood" was not equal for all victims. A disaster like this one cannot be conceptualized as if it were a simple uniform stimulus. In this paper we have explored one dimension of the disaster experience; the recovery of victim families.

We have found that the help sources from which the largest proportion of families received aid was relatives and friends. Of course, many families – about one-third – also received various types of assistance from the Red Cross, Salvation Army, and other formal organizations. But the importance of informal groups in such emergencies cannot be underemphasized. Despite the extreme permeation and dominance of large-scale, highly bureaucratic organizations that provide much structure to American communities, these informal networks remain more critical than many analysts have assumed (Litwak and Szeleny, 1969). In crisis events like natural disasters, they are even more important, regardless of the socioeconomic characteristics of the families under study.

We expected that a smaller proportion of high income families would receive aid from relatives than those with low incomes, and possibly that lower income families might retreat from offers made by organizational officials. However, this was not the case. More high income families received aid from kin than did those with low incomes. The organizational picture was mixed. More high income families received help from governmental agencies and unspecified voluntary organizations. But lower income families more frequently reported aid from the Red Cross, the Salvation Army, and religious organizations. Most of this aid, regardless of the source, was offered, not asked for.

Whites in the low income sample more frequently received help from kin and friends, but non-whites were more likely to receive help from religious organizations and the Red Cross. Older persons in the low income sample (those 60 and above) received less help from the Red Cross, employers, relatives, friends, Salvation Army, governmental agencies and strangers.

Certain kinds of help were given to some victims more than others. For example, frequently mentioned were food and clothing and rendering of personal services. Transportation rarely was mentioned. Certain types of help were supplied by only one or a few sources. For example, most shelter was provided by relatives. Other kinds of help were provided by a variety of sources, e.g., food and clothing. Most victims reported satisfaction with the help they received.

In examining the internal resource structure of victim families, we analyzed variations by socioeconomic status, race and age. Of course, as would be anticipated, families with higher incomes possessed more internal resources. However, even within the low income sample, whites possessed more internal resources than non-whites in every category with the exception of house insurance. Older persons in this sample more frequently mentioned that they had personal savings than younger persons. And for the higher income sample, older persons less frequently reported that they had life insurance, credit and bank credit but more frequently reported that they had household item insurance.

In conceptualizing victim families during this recovery period we found the analogy of the family as an open system exceedingly helpful. The external groups which provided help to

victim families can be viewed as linkages which aided victim families in adapting to their environment. The linkages which these victim families established varied in terms of the type of linkage established (for example, kin versus the Red Cross) and the number of linkages established. As an open system, victim families also possessed internal resources which also varied in amount and type. We are therefore arguing that "recovery" of victim families after a disaster is a complex process involving many dimensions both internal and external to the family. In this paper we hope we have begun to specify some of the critical dimensions involved in this process.

NOTES

1 Our classification was made along these dimensions because of the low mortality and injury rate. Within the entire city only 17 were reported dead and 550 injured as a result of the tornado. Within the total victim sample (338) only 6% had any member with physical injury and only 3 family members in the entire 338 family sample had an injury serious enough to require hospitalization. Hence, the major type of loss for victims centered around their possessions, e.g., house, car, furnishings.

2 Determination of the lower census tracts was based on 1960 U.S. census data, using the variable of property value and median income for each census tract. These two variables gave us the best available index of the socioeconomic characteristics of each census tract. When we ranked the census tracts by median income and median property value, there was the expected high correlation between the two variables (r = .92). (For a detailed description of this procedure see Drabek et al., 1973).

3 Such an "ecological" procedure can result in distortions, i.e., many persons with low incomes might reside in census tracts which have as a collective characteristic high median family incomes (Robinson, 1950; Barton, 1969: 214–216). However, as we have reported elsewhere, analysis of aggregated data based on individual responses such as level of formal education supports the validity of our sample designation in this instance. For example, nearly two-thirds (65%) of the low income victim sample (N = 238) completed eleven years of formal education or less, while all but eighteen percent of the high income sample (N = 100) had graduated from high school or had more years of formal education (Drabek and Key, 1975).

4 Specifically, in terms of help from external groups, nine sources of potential aid were identified; relatives, friends, religious organizations, Red Cross, Salvation Army, voluntary organizations, governmental agencies, strangers and employers. Our concern was with answering the following questions:

1. Which groups aided victim families?
2. What kinds of help did these groups give?
3. Was help offered to victim families or did they have to ask for it?
4. Did victim families report problems in receiving help from these groups?
5. Would victim families turn to these groups again for help if a similar event occurred?

Similarly, for aid obtained in recovery through the utilization of internal resources, we asked the following set of questions about several potential resources, e.g., house insurance, car insurance, savings, credit and the like.

1. Prior to the tornado, what types of internal resources did victim families have?
2. Did victim families utilize these resources as a result of the tornado?
3. Did victim families have any problems using these resources?

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AGENCIES AND THE LOS ANGELES EARTHQUAKE*

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The relationship between victims and emergency relief organizations has been of consistent interest to students of disasters. Much of this interest has been generated by attempts to increase the effect that organizational warning systems have on individuals under potentially disastrous conditions. Although a number of writers have focused on the match between organizational characteristics and environmental demands, little interest has focused on the attitudinal evaluations that victims make of such organizations (Price, 1967; Adams, 1970; Kennedy, 1970; Ross, 1970; Haas and Drabek, 1973). "This is somewhat surprising, since the most widely studied disaster organizations are either governmental or voluntary and thus heavily dependent upon public support, whether for budgetary allocations or contributions" (Wright, 1975, p. 1). In many cases, attitudinal information about emergency relief organizations has been inferred from information as to how potential disaster victims respond to warnings. The implication has been that the nature and timing of warnings during the threat and warning phases are significant predictors of later behavior and emotional response (Cantril, 1940; Killian, 1952; Powell and Rayner, 1952; Janis, 1954; Wolfenstein, 1957; Chapman, 1962; Drabek and Boggs, 1968; Drabek, 1969).

The San Fernando earthquake of 1971 provides a somewhat unique perspective on disasters. First, an earthquake is a natural disaster which, to date, provides no opportunity for warnings to be transmitted to its potential victims [1]. Unlike other studies, the lack of warnings in San Fernando allows us to assume that attitudes expressed about emergency relief organizations are strictly related to victims' post-disaster knowledge of and contact with the organizations and are *not* contaminated by reactions to pre-disaster warnings. Second, unlike many of the disasters studied in the United States, this disaster occurred on the periphery of one of the largest metropolitan areas in the world – an area which contains a highly sophisticated communication system and the California Institute of Technology, one of the major centers for the seismological study of earthquakes.

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This paper will explore the effects of a natural disaster, the 1971 San Fernando earthquake, on the victims' subsequent contact with and attitudes toward emergency relief organizations. The findings will be related in part to theoretical propositions concerning social solidarity in the aftermath of a natural disaster. We suggest that the social environment in which the earthquake took place was a crucial factor in determining: 1) the evaluations Los Angeles residents made of formal agencies; 2) the contact they had with the various agencies; and 3) their awareness of the various agencies.

METHODOLOGY

Description of Sample

The data reported in this paper comes from the Los Angeles Metropolitan Area Survey (LAMAS). Households were interviewed as part of the semi-annual survey conducted by the Survey Research Center at UCLA [2]. The three dependent variables defined in the present paper were obtained from the following questions:

1. Now we'd like to ask about the organizations and agencies that worked on earthquake problems. Do you know of any organizations or agencies that worked on earthquake problems? (Any others?) (Respondent was presented with a card listing eleven organizations.)
2. Did you have any personal contact with any of these organization or agencies?
3. We'd like you to tell us how effective these organizations were. Here is a card with a scale on it. As you can see, 5 represents "very effective", 3 is "somewhat effective", and 1 represents "not effective". You can use any number between 1 and 5. Please give me the number between 1 and 5 which shows how effective you think the organization was.

TABLE I

Respondent's Perception of How Severely He/She was Affected Within Each of the Three Impact Zones

"How badly were you or your family affected by the earthquake?"	Impact Zone			Total N
	High %	Moderate %	Low %	
Very or Somewhat Badly	84.3	19.3	4.5	111
Little or Not At All	15.7	80.7	95.5	667
TOTAL N	70	133	575	778*

*Three persons did not answer the question.

Gamma = .879

$\chi^2 = 327.7$, 2 *d.f.*, $p < .001$

Definition of Impact Zones

Because data obtained in these surveys represents the entire Los Angeles Metropolitan area, a useful analytic technique was to divide the area into High, Moderate, and Low Impact areas. These divisions reflect both the geographical nature of the earthquake as reported by experts [3] and also the perceptions of severity as reported by our subjects (see Table I).

RELEVANT LITERATURE

The relationship between disaster victims and disaster-related organizations has received considerable attention in previous research (Fritz and Marks, 1954; Form and Nosow, 1958; Moore, 1958; Bates et al., 1963). Our data show that the evaluations of disaster-related organizations by the victims of the 1971 San Fernando Earthquake are much more positive than are comparable responses by victims in previous disaster studies. Yet, in spite of this overall positive pattern, the rank-order of the various organizations remains very similar to that found in past research. In this section we will explore these similarities and differences and will relate them to theoretical conceptions of social solidarity in the aftermath of a disaster.

Previous researchers have found that disaster victims typically evaluate rescue and short-term

relief organizations more positively than they rate formal, professional rehabilitative organizations. The fire department and the armed services, which are active for a short period of time following a disaster, always seem to receive very favorable comments, while the Salvation Army receives nearly as favorable a response. Just as consistently, the American Red Cross receives the worst evaluation (Form and Nosow, 1958, p. 119; Moore, 1958, p. 101; Bates et al., 1963, pp. 51–53; Marks and Fritz, 1954, as cited in Barton, 1963, p. 179).

Many attempts have been made to explain these findings. Most explanations have suggested that the formal bureaucratic procedures followed by the Red Cross clash with the more informal, personally-oriented norms of rural Louisiana or Texas where most of the disaster studies have taken place (Bates et al., 1963, pp. 45–46; Moore, 1968, pp. 177–178). The Red Cross's policy of awarding financial assistance according to relative need rather than absolute loss is also mentioned as a potential explanation of negative evaluations (Moore, 1958, pp. 179–180; Adams, 1970, p. 395).

Turner has theorized that the hostility toward formal, professional relief agencies such as the Red Cross may be a consequence of the disruption of normal social organization after a disaster and the subsequent process of re-establishment. Turner (1967) suggests that following this disruption the victims need to re-establish basic social bonds based upon shared sentiments before they can re-establish more formal social bonds based upon an interdependence due to the presence of specialized tasks.

TABLE II

Comparison of Ranking of Organizations by Mean Effectiveness Rating as Given by Respondents Who Indicated Awareness of Agencies and Those Who Indicated Contact With Agencies*

Organization	Those Aware of Agency Whether or Not Contact With Agency Occurred				Those Who Established Contact With the Agency Being Rated			
	Rank	Mean Rating	Stand. Dev.	No. of Responses	Rank	Mean Rating**	Stand. Dev.	No. of Responses
Fire Dept.	1	4.8	0.5	178	1	4.9	0.2	17
Radio & Television	tie 1	4.8	1.0	19	–	–	–	–
Gas Co.	3	4.7	0.6	106	2tie	4.8	0.7	40
Dept. of Water & Power	tie 3	4.7	0.7	118	4	4.7	0.7	39
Telephone Co.	5	4.6	0.8	87	2tie	4.8	0.6	37
Public Works Dept.	6	4.5	0.8	36	5	4.6	0.7	17
Salvation Army	7	4.4	0.9	69	–	–	–	–
Disaster Service of L.A. County	tie8	4.3	1.0	27	–	–	–	–
Health Dept.	8	4.3	0.9	11	–	–	–	–
Red Cross	10	4.2	1.1	275	6	4.3	1.2	46
Civil Defense	11	4.0	1.2	38	–	–	–	–

*Respondents were asked, "Do you know of any organizations or agencies that worked on earthquake problems (any others)?" Following an affirmative response, the respondent was asked:

> We'd like you to tell us how effective these organizations were. Here is a card with a scale on it. As you can see, five represents "very effective", three is "somewhat effective", and one represents "not effective". You can use any number between one and five. Please give me the number between one and five which shows how effective you think the organization was.

Respondent was also asked if he or she had had personal contact with any organizations mentioned.

**Ratings were omitted when less than 7 respondents indicated that they had had contact with an agency.

RESULTS

As Table II demonstrates, the evaluations by the San Fernando Earthquake victims of the effectiveness of disaster organizations are uniformly positive. No organization received a mean rating of less than 4.0 out of a possible high of 5.0. The ratings are presented first for all those who merely indicated an awareness of the particular organization, whether or not they had had contact with it, and secondly, for those who had had contact with the organizations they were rating. The two rankings are very similar and both are positive. In contrast, the standard deviations around the means do show some differences. Among those who had contact with a listed organization, the variability in perceptions of effectiveness is greatest for the Red Cross.

Table III compares the over-all response patterns in the Flint-Beecher Tornado with those of the San Fernando Earthquake [4]. A rating of four or five in our study was considered for this and subsequent comparisons as a positive evaluation; three was considered neutral; and a rating of one or two was considered negative. The Los Angeles area ratings are much more positive than those recorded in Flint-Beecher. The differences in evaluations between this study and prior ones, may reflect 1) a change in the quantity of organizational assistance received; 2) a change in the quality of organizational assistance received; and/or 3) differences between life styles in a metropolis in 1971 and a rural or small-city area in the 1950's. We would suggest that all three conditions were operative in producing the higher evaluations of disaster organizations in Los Angeles.

I. The Red Cross

As mentioned above, the American Red Cross has been a major source of attention in previous research. When we focus on our data concerning the Red Cross, it is clear that even this much-maligned disaster organization received highly positive evaluations. Table IV compares data on the Red Cross from the present study with data from two previous

TABLE III

Comparison of Evaluative Responses Concerning All Organizations in the 1953 Flint-Beecher, Michigan, Tornado and the 1971 San Fernando Earthquake

Disaster	Evaluative Responses in Percent			Total N of those Responding to Question	
	Positive	Negative	Non-Evaluative	N	Total N of Sample
a. Flint-Beecher Tornado*	31	9	60	Not Given	118
b. San Fernando**					
1) those aware of organization with or without contact	76	6	18	386	781
2) only those with contact with organization	89	3	8	96	781

*Source: Form and Nosow, 1958, p. 119.

**Ratings of five or four were considered as positive; three was considered neutral; and two or one were considered as negative.

TABLE IV

Comparisons of Evaluative Responses Concerning the American Red Cross in Three Disasters: the 1953 Flint-Beecher, Michigan, Tornado; the 1957 Hurricane Audrey in Louisiana; and the 1971 San Fernando Earthquake

Disaster	Number and Type of References				
	Positive	Negative	Non-Evaluative or neutral	Response Total	Total N
a. Flint Beecher Tornado*	34	49	101	184	116
b. Louisiana Hurricane**	28	36	4	68	61
c. San Fernando Earthquake***					
1) those aware of organization with or without contact	209	16	50	275	781
2) only those with contact with organization	33	3	9	45	781

*Source: Form and Nosow, 1958, p. 119.
**Source: Bates et al., 1963, p. 51.
***Ratings of five or four were considered as positive; three was considered neutral; and two or one were considered as negative.

studies. Los Angeles residents expressed positive opinions of the Red Cross. Nonetheless, when compared with other agencies, the Red Cross, relative to other agencies, remains in its familiar position at or near the bottom of the list (see Table II). We would attribute this relatively critical evaluation of the Red Cross to four sources: 1) a general dissatisfaction with relief efforts in Los Angeles; 2) dissatisfaction with the previously mentioned Red Cross policy of awarding assistance on the basis of need rather than loss; 3) dissatisfaction with the degree of coordination of relief activities; and 4) dissatisfaction with the oft-cited bureaucratization and red tape associated with the procedures used by the Red Cross.

II. Respondents' Contact With Agencies

Twelve percent (N = 96) of the total sample had personal contact with one or more agencies. In the High Impact Zone, 78.5 percent had personal contact with one or more agencies. We hypothesized that contact with agencies would be most strongly predicted by the extent to which the individual respondent was affected by the earthquake. In addition, we assumed that damage suffered would, in large part, correlate with the respondent's proximity to the earthquake. Respondents were asked, "How badly were you and your family affected by the earthquake? Very badly, somewhat badly, a little, or not at all?" Two hundred thirty-three persons responded that they were affected; (see Table I for distribution by impact zone). This group was then asked to describe the ways in which they were affected, i.e., damage to property, personal injury, psychological stress, etc.

Prediction of Contact With Agencies

It was our assumption that agencies would seek out persons who had suffered the greatest amount of damage, or, alternatively, persons who had suffered severe damage would actively seek agency assistance. It seemed logical to as-

sume additionally that severe damage would be correlated with location, but that, given the nature of earthquakes, this relationship would not be absolute. Finally, it was hypothesized that persons from higher social classes might have greater ease in obtaining access to post-disaster services due to their greater knowledge of organizations and their greater ability to manipulate such systems. Janis (1954) gave this idea some support when he suggested that persons of lower social class status and of minority ethnic groups anticipate receiving less aid in the event of a disaster and assume that higher status persons in the community will receive preferential treatment. Janis' observation was supported to some extent by data collected by Bates et al., on the Gulf Coast (1963). Thus, three independent variables were defined: 1) location of respondent's residence; 2) extent of physical damage suffered by the respondent; and 3) the respondent's social class as measured by income. Other variables, although sometimes highly correlated with agency contact, were eliminated from consideration either because they appeared to have no intrinsic theoretical importance, or because the relationship they seemingly held with contact was readily eliminated by one or a combination of the other three variables.

TABLE V

Correlation Matrix for Those Affected of Three Independent Variables, Damage, Location and Income, with Dependent Variable, Agency Contact

	Damage	Location	Income
Contact With Agencies**	0.39*	0.58*	0.19*
Extent of Damage***		0.57*	0.25*
Location****			0.19*

N = 208

*$p < 0.001$

**Contact is coded as follows: 0 = no contact; 1 = contact with one agency; 2 = contact with two, three or four agencies; and 3 = contact with five or more agencies.

***The Index of Damage-Injury was constructed as follows: All respondents who indicated that they were at all affected by the earthquake were asked, "What happened to you?" The responses were coded in detail and broken down into five categories: 1) No damage or injury, N = 63; 2) Slight damage: a few general household items broken or an injury not requiring medical treatment, etc., N = 28; 3) Moderate Damage: chimney, floors, roof or driveway *or* refrigerator broken, etc., N = 63; 4) Moderate-severe damage: driveway cracked *and* refrigerator broken, or china broken *and* stereo set broken, etc., N = 37; and 5) Severe damage: extensive structural damage requiring condemnation or extensive repairs or injury requiring medical attention, N = 34. Very few injuries were reported.

****Location is coded as follows: 1 = Low Impact Zone; 2 = Moderate Impact Zone; and 3 = High Impact Zone.

Income, damage, and location are all significantly correlated with agency contact (Table V). However, when partial correlations controlling for location were computed, it was found that the correlation between contact and damage fell to 0.10. When multiple regression analysis was used, location was found to be the overwhelmingly significant predictor of agency contact (Table VI), although both income and extent of damage slightly strengthened the prediction [5].

The results substantially destroyed our original hypothesis. Location of the respondent was a far more powerful predictor of contact than was the extent of damage or income. However, when we further examined the relationship for only those who reported some physical injury or damage (170 of 233 who reported that they were affected), it was found that a somewhat curvilinear relationship existed between contact and damage. Persons with slight amounts of damage, as well as those with severe amounts of damage were more likely to report contact with agencies than were persons with moderate amounts of damage (Table VII). Whether the seeming curvilinearity is an artifact or is of relevance is difficult to ascertain. The damage variable was transformed into a linear construct [6], and was then once again entered into a regression analysis. The intention was to test whether the curvilinearity in and of itself was a significant predictor of contact.

Entry of the transformed variable did indeed change the character of the regression (Table VIII). Although location remained the

TABLE VI

Multiple Regression of Contact With Agencies on Location, Income, and Amount of Damage for All Those Reporting Some Effects from the Earthquake

Independent Variables	*B*	*Beta*	Standard Error	*T*-Test of *B* = 0	*F*
Location	1.21	0.53	0.16	$p < 0.001$	58.6
Income	0.03	0.08	0.03	N.S.	1.7
Damage	0.10	0.08	0.09	N.S.	1.2
Constant −1.75					

$R = 0.59$ $F = 36.9, 3\&204$ *d.f.*, $p < 0.001$
$R^2 = 0.35$
Standard Error = 1.53
N = 208

TABLE VII

One Way Analysis of Variance of Agencies With Which Respondent Was in Contact by Amount of Damage for Those Reporting Some Effect From the Earthquake

Extent of Physical Damage Reported	Mean Number of Agencies Contacted	N
None	0.21	63
Slight	1.25	28
Moderate	0.49	63
Moderate-Severe	1.22	37
Severe	3.03	34
Total	1.0	225*

Source	Degrees of Freedom	Sum of Squares	Mean Squares
Between Groups	4	199.4	49.9
Within Groups	220	582.6	2.6
Total	224	782.0	

$eta^2 = 0.25$, $F = 18.8$, $p < 0.001$

*Eight respondents of the 233 who reported being affected did not specify whether or not they had contact with agencies.

TABLE VIII

Multiple Regression of Contact on Transformed Damage Index, Location and Income for All Those Reporting Some Physical Injury or Damage

Independent Variables	*B*	*Beta*	Standard Error *Beta*	*T*-Test of *B* = 0	*F*
Location	1.23	0.49	0.16	$p < 0.001$	50.9
Income	0.06	0.13	0.03	$p < 0.05$	4.5
Damage	−0.56	−0.42	0.25	$p < 0.05$	4.9
Damage, squared	0.18	0.53	0.07	$p < 0.01$	7.9
Constant −1.54					

$R = 0.61$ $F = 30.6, 4\&203$ *d.f.*, $p < 0.001$
$R^2 = 0.38$
Standard Error = 0.82
N = 208

TABLE IX

One Way Analysis of Variance of Agencies of Which Respondent Was Aware by Extent of Damage Suffered

Extent of Physical Damage	Mean Number of Agencies	N
None	0.89	63
Slight	1.82	28
Moderate	1.86	63
Moderate-Severe	1.68	37
Severe	2.38	34
TOTAL	1.63	225*

Source	Degrees of Freedom	Sum of Squares	Mean Squares
Between Groups	4	58.2	14.6
Within Groups	220	302.2	1.4
TOTAL	224	360.4	

$eta^2 = 0.16, F = 10.6, p < 0.001$

*Eight respondents of the 233 who reported being affected did not specify whether or not they were aware of the various agencies.

TABLE X

One Way Analysis of Variance of Average Difference Between Awareness and Contact by Extent of Damage Suffered

Extent of Damage	Average Excess of Awareness over Contact*	N
None	0.95	63
Slight	1.43	28
Moderate	2.17	63
Moderate-severe	1.22	37
Severe	0.82	34
TOTAL	1.38	225**

Source	Degrees of Freedom	Sum of Squares	Mean Squares
Between Groups	4	62.9	15.7
Within Groups	220	558.0	2.5
TOTAL	224	620.9	

$eta^2 = 0.10, F = 6.2, p < 0.001$

*The number of agencies which the respondent reported having had contact with was subtracted from the number of agencies which the respondent indicated merely being aware of, whether or not contact had been established.
**Fifteen respondents of the 233 who reported being affected did not specify whether or not they were aware of the various agencies.

major predictor, income and damage gained predictive power and the multiple R was slightly increased. In addition, it can be observed that the transformed variable is of some significance in predicting contact. How this shift might be interpreted is open to alternative speculations.

In our opinion, the significant finding is that recipients of post-disaster services are more often determined by a geographic or areal definition of the disaster's impact area than by actual need [7]. We would suggest that the philosophy and policies of the traditional post-disaster services have been formed in large part from the history of services traditionally dispersed. Experience or necessity has gradually caused each agency to define a mission with a correlated set of normal procedures. In some cases, these procedures may have taken on a ritualized or sacred character. To the extent that this has occurred, procedural change becomes increasingly difficult. It is our impression that few of the traditional post-disaster service agencies in the United States have had experience working with earthquake victims. In addition, it is our impression that earthquakes, particularly in large urban areas such as Los Angeles, present different kinds of problems from most other types of disasters. Literally everyone in the Los Angeles basin felt the quake. In addition, while the most severe damage *does* occur within a certain proximity of the epicenter, scientists have become increasingly aware that soil conditions, the directionality of fault lines and other geological conditions may well determine the extent of ground movement at points quite distant from the epicenter. Thus, areas of severe physical damage as well as area of potential psychological effect cannot be as easily defined in earthquakes as in other types of natural disasters such as tornadoes and floods.

An alternative, although not necessarily antagonistic interpretation is that some potential recipients of available services defined themselves as either not eligible or not in need of services. The fact that family and friends were often reported as significant sources of aid would support this view. In addition, the mass media's focus on the High Impact Area may well have accelerated this type of self-definition.

III. Awareness of, but No Contact with Agencies

Once we observed the potentially curvilinear relationship between damage and contact, it seemed useful to examine the variable of agency awareness apart from agency contact. Far more persons reported awareness of agencies than reported contact with them and the two were highly correlated. However, while agency

TABLE XI

Average Difference Between Awareness and Contact by Impact Zone

Impact Zone	Average Excess of Awareness over Contact	Total N
High	0.98	70
Moderate	2.63	136
Low	0.81	575
TOTAL	1.26	781

Source	Degrees of Freedom	Sum of Squares	Mean Squares
Between Groups	2	323.1	161.6
Within Groups	778	2100.1	2.7
TOTAL	780	2423.3	

$eta^2 = 0.13, F = 59.9, p < 0.001$

awareness, like contact, was linearly related with location, awareness, in contrast to contact, has a flatter relationship with the damage reported by the respondent (Table IX).

When a transformed variable is created by subtracting the number of agencies with which the respondent had contact from the number of agencies of which he was aware, the created distribution is a reversal of the curvilinear relationship found in Table VII (see Table X). Interestingly enough, this curvilinear relationship holds for location as well as damage (Table XI).

We suggest that this finding supports our earlier observation that a number of persons who perceived themselves as experiencing moderate amounts of damage, although aware of agencies involved after the earthquake, either did not have access to the agencies, or failed to avail themselves of the services. Although Tables X and XI would lead us to believe that persons experiencing moderate amounts of damage resided in the Moderate Impact Zone, further examination indicated that this was not the case. Persons reporting moderate amounts of damage were *equally divided between the three zones.*

CONCLUSION

We conclude that agency awareness is the product of two factors: 1) contact with the various agencies on the part of potential service recipients; and 2) media coverage. Obviously, if a respondent had contact with an agency, he was aware of it. But additionally, awareness could come about through exposure to the media. Virtually every respondent reported media exposure with radio being the most important immediate source of information and television being the most important overall source. Since we have no detailed information on media exposure, i.e., extent of time spent in reading or listening, or the specific sources to which exposure was made, it is not possible to further explore the types of media or the extent to which media enhanced agency awareness.

It is interesting to note that a substantial number of persons who reported moderate amounts of physical damage did not report having had contact with any of the agencies. This same group generally indicates awareness of the agencies, but two-thirds of them resided outside the area defined as the High Impact Zone. This combination of findings suggest that persons who are outside a certain perimeter following a disaster are given less assistance by disaster agencies and are not defined by others as "victims", while often experiencing what they themselves consider to be moderate physical and psychological damage. The existence of an active local media and this groups' location within a large metropolitan area may well enhance their awareness of their position *vis-à-vis* those publically defined as victims.

NOTES

1 Although warning systems for earthquakes are currently under investigation and a special report was recently issued by the National Academy of Sciences on the potential policy implications of such warnings, the warnings that have been attempted to date have not been particularly successful and their dissemination has been primarily to the scientific community rather than to the general public (National Academy of Sciences, 1975).

2 The Los Angeles Metropolitan Area Survey, initiated in the Spring of 1970, is a shared-time omnibus survey of the Los Angeles County public, reported twice a year. Households were surveyed during a two month period immediately following the February earthquake and were asked forty-two specifically developed earthquake-related questions in addition to the previously prepared LAMAS III instrument. In addition, the same items were used in re-interviewing persons from the LAMAS II (Fall, 1970) Sample Frame.

Samples used in LAMAS II and III can be considered representative of Los Angeles County with one exception, the extreme northern (Newhall, Antelope Valley) and western (Malibu, Calabasas, etc.) regions of the County were not included in the frame for these samples. The design of the samples was a multi-stage cluster selection of 30 Census Tracts after stratification by geographic region, median income, and percent black. Respondents within selected households were chosen by means of a random selection table.

The fact that the only persons re-interviewed from the LAMAS II Sample Frame lived in three Census Tracts (1064,

1276, and 3021) means that certain parts of the San Fernando Valley are technically over-represented in this data. These tracts were purposely selected because of their proximity to the earthquake epicenter and to the Van Norman Dam; 94 respondents were part of this re-sampled group.

The response rate for the original fielding of the LAMAS II was 60 percent; the response rate for the earthquake area supplementary selections from the LAMAS II Frame was 81 percent (N = 94); the response rate from LAMAS III was 70 percent (N = 687).

3 This division was made with reference to tables of seismographic and accelerographic readings and to damage estimates using the Modified Mercalli Intensity Scale. These tables and maps were provided by Professor C. Martin Duke of the Earthquake Laboratory, UCLA School of Engineering and Applied Science.

4 The reader should be cautioned that comparison of organizational ratings across time and data sets is at best suggestive. Because of the diverse methodologies used in the data sets, any effort to apply statistical tests or analysis would be meaningless. However, given the limited data available, it behooves the individual student of disasters to at least attempt comparisons of their data indicators with those of others.

5 One can argue the appropriateness of using what may be considered ordinal-level variables in statistical techniques designed for interval-level variables. In addition, the process by which we collapsed and summarized our variables is open to discussion. Given the impreciseness of variable measurement, whether ordinal or interval, in the social sciences, and the lack of multi-variable techniques available for use with ordinal level variables, we do not consider the use of multiple regression as a summary statistical technique inappropriate. It should, however, be remembered that to the extent that the analytical techniques and/or the variable construction is inappropriate, the results should be viewed as suggestive rather than definitive.

6 Since the mathematical model employed in regression analysis assumes that each independent variable is linearly related to the dependent variable, it was not possible to directly test the strength of the curvilinear relationship between contact with agencies and damage. Consequently, the variable measuring damage was mathematically transformed into a new variable which could be tested using the regression model (i.e., the value of the damage index assigned to each respondent was squared). This new, second-order variable was then inserted into the regression equation along with the original first-order term. To test for the existence of curvilinearity the following formula is applied:

$$F_{1,N-K-1} = \frac{(R_b^2 - R_a^2)}{(1 - R_b^2)} \times \frac{(N - k - 1)}{1}$$

where R_a^2 = the R^2 obtained in the regression equation without the second-order variable (i.e., Table VI).
R_b^2 = the R^2 obtained in the regression equation which includes the second-order variable (i.e., Table VIII).
N = the number of cases
K = the number of variables

In the present example, $F = 9.8$ with 1 and 203 degrees of freedom which is significant at $p < 0.01$. Consequently, it can be argued that a curvilinearity does, to some extent, exist.

7 Two alternative, but related explanations exist. One involves the access to Small Business Administration (SBA) loans: the second relates to concerns about property. A second data set gives some insights into the possible relevance of these competing explanations for the reported findings.

A high number of persons took advantage of SBA loans following the San Fernando earthquake. Persons who received money, regardless of location and need, might have high opinions of organizations. Unfortunately the data set used for this paper contains no information on respondents' applications to the SBA. Since the data was collected within two months of the earthquake, date of interview is not readily available, and a large volume of the SBA applications came in later, there is some reason to think that our findings do *not* simply reflect receipt of money.

A second set of data (referred to as the Sylmar data) was collected from 100 families in the high impact zone during the summer of 1971 – six months after the earthquake occurred. Of this group, eighty families had applied for an average of $3,765 in aid. Seventy-one had received an average of $3,801; seven were refused aid; and two were still pending at the time of interview. The Federal policy on disaster loans at that time required that only $500 of the first $3,000 borrowed must be repaid. As a result of the high rate of applications, primarily during the San Fernando earthquake, the policy was subsequently changed in the Federal Disaster Assistance Act of 1974.

Concern with property and its protection may be crucially related to the respondents evaluations of agencies. The Sylmar data, unlike the LAMAS set reported in this paper, included a great deal of information about evacuation behavior and little information on agencies. Forty-four percent of that sample, which was limited to the high impact zone, did evacuate. Over half of the evacuees periodically returned, against police order, to check on their property.

Evaluations or organizations may, thus, be related to both property concerns and receipt of money. The methodological infeasibility of combining the two data sets does not allow the alternative explanations to be investigated. However, it is our opinion that, regardless of the competing possibilities, location remains a crucial definer of "victim". (Bourque et al., June, 1973)

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A REVIEW ESSAY ON GILBERT F. WHITE (Ed.) *NATURAL HAZARDS: LOCAL, NATIONAL AND GLOBAL.* (New York: Oxford University Press, 1974)

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Natural Hazards: Local, National and Global, edited by Gilbert F. White, a product of work by fifty contributors carried out in twenty-three countries over a period of six years, a selection of those coordinated by and emanating from the Natural Hazard Research Group at the Universities of Colorado, Clark and Toronto, is clearly to be regarded as something of a bible in its field. This reviewer is a weather-worn but new recruit to the realms of natural hazard research, having entered the ranks during the closing stages of this book's preparation. To offer a review, even with all the humility that can be mustered, can be only compared to David, but there the comparison ends. I have no "slings and arrows", there is an omnipotent but no aggressive Goliath and no battle! There is to be an opportunity for response from the Editor – perhaps my comparison should be to Daniel?

The book comprises thirty-two papers under the five headings of Introduction, Individual and Community Response, Decision Processes, National Reviews and Global Summaries. There is an excellently ordered table of contents, comprehensive index and the papers include ninety figures separately tabled. The Introduction is a single chapter by the Editor, and of the remaining four headings, twenty-two papers come under Individual and Community Response with the remaining nine being divided as two under Decision Processes, four under National Reviews and three under Global Summaries. The book clearly is not intended for a popular readership and relies on a foreknowledge of the "Natural Hazard" programme, and the Editor's name in its appeal to the research specialist. Without that foreknowledge one might expect a comprehensive description of the nature, behaviour and effect of natural hazard events throughout the world. Without that foreknowledge one might similarly be misguided by the Local and National parts of the title in a book intended for international readership and bi-national publication.

Of the twenty-two papers under Individual and Community Response, ten are based on research locations within the USA, four on African countries, with one paper each on India, Bangladesh, United Kingdom, New Zealand, Australia, Mexico and Norway and with a concluding paper with multinational coverage dealing with cross-cultural research. The two papers on Decision Processes, decisionmaking and economic analysis are very much results of research contained within the North American continent and the National Reviews include three specialist papers from North America on

Editor's note. Certain publications because of their scope, import or significance will be given special, extended reviews usually involving two or more reviewers, with the author allowed a pre-publication response. This review essay is the first one in the journal although it has only one reviewer since a second reviewer failed to meet a designated deadline and no further delay seemed warranted.

policy, New Zealand on insurance, and the USSR on hazard control and warnings, with a general report from Japan. Of the three Global Summaries two have tables of data of which approximately half derivates from North American hazard occurrence; the same proportion can be said to apply to the whole of the book heavily loading the Local and National (US) content.

The Introduction contains reference to the more common extreme geophysical events as "avalanche (snow), coastal erosion, drought, earthquake, flood, fog, frost, hail, landslide, lightning, snow, tornado, tropical cyclone, volcano and wind," a total of fifteen separate hazards. The book's contents deal with ten of these (counting "freeze hazard" as frost), omitting detailed reference to fog, hail, landslide, lightning and – surprisingly – tornado. Neither is there detailed reference to bush fire, plague or epidemic. Excluded, for instance, are the earthquake areas of the Mediterranean and South and Central America; the tropical cyclone areas of the Pacific and the Caribbean, and the flood plains of Central Europe or North Africa, the three hazard types of flood, tropical cyclone and earthquake being specified as "ranking highest in the order given . . . in the toll they take in loss of life and damage to human habitation." Clearly as is also stated in the Introduction, "the selection of particular places and hazards was to a considerable extent fortuitous," being dependent on the availability of competent investigators and field staff.

"The studies are to be viewed as exploratory and as intended to probe the variety of human responses that are presented in the contemporary human scene in dealing with a selection of natural extremes" but it is not enough to allow" the studies . . . to speak for themselves in outlining problems of methodology and in indicating the main lines of conclusions." This most of the papers do very well indeed, but the book has a weak structure and severely lacks the framework of a predetermined aim or assignment. There are some very sound statements in the papers and in the Introduction recommending policy, but the results of the papers included are not used to suggest methods of implementing that policy, and even the Global Summaries are not summaries of the chapters or conclusions of the book, but are separately submitted papers. Without this framework of a predetermined role the book is the result of an accretion of valuable but individual papers, with no overall conclusion, which, had it examined the conclusions of some of the papers it contained, could have emphasised some of the book's valuable contents, indicated some of its drawbacks and omissions and some of the gaps appearing in research so far, and why findings "are . . . more divergent than convergent".

The stated aim of the collaborative research programme initiated in 1967 was to attempt to "explore the applicability of findings from the flood studies to other geophysical hazards and to investigate the interaction of social and natural systems in a variety of environments and cultures beyond those that had thus far been covered in North America." As part of the hypothesis for the research programme, which receives detailed description in the Introduction, three types of response to natural hazards are characterised as follows and enlarged upon:

1. Folk or pre-industrial;
2. Modern technological or industrial;
3. Comprehensive or post-industrial

Folk adjustment is described as modifications being more in harmony with nature than demanding control of nature and they are easily abandoned. Modern technological responses are a more limited range of technological actions emphasising control of nature. Comprehensive responses combine features of the previous two groups. Chapter 13, "Northeast Tanzania: Comparative Observations Among a Moisture Gradient (Heijnen and Kates) points to the extreme vulnerability of a stage of change between established folk and modern technological response. There

is a tendency, as development takes place, for the "easy abandonment" of folk response to gather momentum in favour of technological response in order to control nature, producing as it does so a society (or community) which has forgotten its previous ability for folk response in its hurry to impose its technological power (or has gone full circle back to denying the earthquake problem at all in San Francisco as suggested in Chapter 20, "Human Adjustment to the Earthquake Hazard of San Francisco, California," by Jackson and Muckerjee). An over-reliance on technology results. This process produces its own administrative machinery which, because folk responses have disappeared, the ability and power for possible response, i.e. technological, is with officialdom. Government and other power structures become the only medium by which response can be made, which in itself reinforces the power structure and enlarges the gulf which exists between officials and the community at large. All this, it is the contention of this reviewer, is the usual situation within the USA and one is frequently led to wonder how a methodology for sociological research in particular, can be applied to parts of the world outside the North American continent. However, it would be interesting to know how much cross-cultural research has taken place *within* that continent, such as the comparison of responses between Tallahassee in Florida, Pass Christian in Mississippi and Galvaston in Texas (Chapter 4, "Attitudes Toward Hurricane Hazard on the Gulf Coast," Baker and Paton) before leaping into convenient (too convenient) neighbouring research stamping grounds of Puerto Rico, Mexico and the Virgin Islands. What study has been made of response by religious or ethnic minority groups within the USA and Canada, or are these now no more than an artificially preserved remnant of "folk" culture preciously protected against the progress of technology. What of the Pueblo communities in New Mexico, black communities of the "deep South" cotton belt and the rural communities of Tennessee and West Virginia, but perhaps not to mention the Indian reservations and Menonite communities?

The question which recurs again and again as one progresses through the book is that of how much is research *method*, developed within the North American Continent, applicable to other parts of the world, which will always be less-developed than the average North American location and very often "under-developed". Until the method has been proven, the application of results cannot even be considered. A major omission of the book is any discussion of research method with the conclusion that it either can or cannot be applied. The Introduction includes the forty-two part Questionnaire and eleven part sentence completion test prepared for use in the investigations and states that "the basic interview was modified from place to place in order to take account of differences in local environment." On reading Chapter 23, "Problems in the use of a Standardised Questionnaire for Cross-cultural Research on Perception of Natural Hazards," one is bound to draw the conclusion that there are indeed some major problems as one reaches illiterate and semi-literate societies and even language barriers (sic) and that perhaps questionnaires are not the best way of discovering attitudes inherent in alternative cultures to those of the West as they depend "entirely on the researchers ideas and provide no means of tapping the cognitive word of the respondent on his own terms." One is left in considerable doubt about the value, outside North America, of the questionnaire that has been used, for anything other than 'broad though rough comparisons'. And this is evidently the principal research tool of the programme which has sought to explore cultures beyond those of North America. Only eight of the twenty-two chapters on Individual and Community response make any use of the results of the questionnaire or refer to the successful application of other research methods developed within the USA and applied elsewhere. It appears to fail on many

counts either because it is too complicated to achieve spontaneous replies, is too complicated for simple responses based on a fatalistic ignorance of adjustment choice, assumes too high a level of involvement with the subject, too high an ability for articulate answer, assumes a common language and above all common values. Research into natural hazard is at the start, and has been formed as a multi-disciplinary programme. Is there not a clear case here for a strong injection of anthropological input?

Two lessons are indicated as being the result of man's continued and increasing losses as a result of natural events. One is that "there must be a careful sharing of the skills, experience and research capacity of the family of nations." Careful certainly, and the greatest care to avoid the assumption that research methods developed in any one place will be applicable to any other.

The second lesson offered is that "modern societies cannot expect to cope effectively with hazards in the environment by relying solely upon technological solutions but (there must be) the skillful sensitive use of a wide range of adjustments, including engineering devices, land management, and social regulation. To depend upon only one sort of public action is to court social disaster, environmental deterioration and enlarged public obligations." Yes indeed, but care must also be applied here so that, for instance, the range of adjustments to tropical cyclones given in Chapter 30 is not seen as separate but as part of a "comprehensive" programme of adjustment, ("Global summary of Human Response to Natural Hazards: Tropical Cyclones," White, A.U.). Comprehensive adjustment, the third of the three groups of response, are now the area of the greatest application of research and applied research under the heading of Predisaster Planning that has taken place since the completion of this book's preparation. However adequate the research method may prove to be, the mere presentation of results is not sufficient. For the perspective offered by the global summaries of human response to floods (Chapter 31) tropical cyclones (Chapter 30) and earthquakes (Chapter 32) "to be an invaluable aid" to the Office of the Disaster Relief Coordinator or to any other official or organisation whether it be a local city mayor or international agency, there must be an intermediate stage of the study of implementation. This involves management study as yet another discipline in the group but which is essential if research results are to be assimilated by those to whom they are the most use. In many ways this book epitomises the gulf between research result and application. "Applied research" rarely seems to be an academic goal but if academics are to achieve real usefulness there must be attention and "care" given to the application of results. *How* will the contents of those three chapters be an invaluable aid is not a question to be left unanswered by researchers. To answer the question thoroughly there must be a tailor-made analysis of the socio-economic pattern of activity of a specified location and environment into which an extreme natural event could occur. Any methodology for a study of this kind, to parallel that epitomised by the response questionnaire is absent from the book,the final paragraph to the Introduction of which admits that it is "a series of loosely coordinated efforts to deepen the understanding of social-physical interactions, to begin to construct a more general theory of such behaviour in extreme situations, and to apply the findings to public action. They are exploratory rather than definitive, but they promise new understanding and practical influence." It is not a *general* theory of behaviour in extreme situations that is required but a methodology for understanding the behaviour of *specific* groups and for conveying that understanding to those who have the responsibility for public action and practical influence. As development continues the onus for response is on officials and organisations. In a number of chapters based on research activity in developed locations, the gap which exists between public and official awareness is referred

to with one side or the other in the initiating role. (Chapters 6, 7 and 8, "Flood Hazard at Shrewsbury, United Kingdom," Harding and Parker; "Perception Research and Local Planning: Floods on the Rock River Illinois," Moline; and "Flood Information, Expectation and Protection on the Opotiki Floodplain, New Zealand," Ericksen). The way in which their understanding grows will determine whether there is to be an ever-widening gulf between official policy and individual perception and whether people will eventually benefit from the actions of those with responsibility. The way in which people *do* cope with the hazards of nature has to find a medium for influencing the way in which people *will* cope in the future. Many of the chapters of this book are stepping-stones which lead us in the right direction, but the book itself could have been a bridge.

Mass Emergencies 1 (1976) 235–236
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COMMENTS ON REVIEW BY MARTIN H. SMITH IN *MASS EMERGENCIES*, VOL. 1, NO. 1, OCTOBER 1975

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The issue of October, 1975, carries a review of my book, *Disaster and the Millennium*. I have no quarrel with most of the notice, since the reviewer, Martin H. Smith, has given it over to a lengthy and relatively accurate synopsis. However, Professor Smith has managed to compress three major criticisms into the final paragraph, and it is with his funereal coda that I wish to deal.

Professor Smith chastises me on three grounds: (1) that my utilization of *millenarian movement* deviates from current usage; (2) that my utilization of *disaster* similarly deviates to the point of becoming "a vague, meaningless concept" and (3) that I have bootlegged in precisely the sort of Le Bonist crowd behavior argument I attack.

I have erred in Professor Smith's eyes by placing the millenarian label not only upon "classical" movements (his term) but on "secular, more rational forms of political protest," i.e., messianic nationalism and totalitarian movements. The twentieth century has been a harsh teacher, and if it has taught anything, it is that secularizing a movement does not necessarily make it "more rational". The point has been made so often – by writers as varied as Norman Cohn, David Apter, and Crane Brinton – that I would have thought it beyond serious contention. If we reserve "millenarian" only for direct descendants of late medieval chiliasm, we find that such movements cease to be politically significant in the West after about 1850. The reason is that from roughly that date millenarian visions, such as Marx's, are expressed in a secular idiom. Ironically, those most eager to show the political demise of "classical" (I would prefer "traditional") millenarianism are such Marxist writers as E.J. Hobsbawm and Peter Worsley. Their developmental schemes depend upon stigmatizing millenarianism as "irrational" and "prepolitical", epithets that may possess some incantatory value but do little to illuminate the subject.

Professor Smith's second objection is more consequential, and I see behind it a conceptual gap that cannot be easily bridged. He takes me to task for straining the meaning of disaster beyond the current literature. While I would reject the implications of "strain," he is indeed correct in the suggestion that I find that literature conceptually inadequate. The reason lies in its failure to appreciate how culture and history structure the perception of what constitutes a disaster. Since so much disaster research has been conducted in post-World War II America, it is scarcely surprising that disaster should be defined in terms of those stress levels that modern Americans find excessive. Nor is it surprising, given the funding patterns and policy implications, that the conceptualization should be geared to the needs of rescue and rehabilitation agencies.

To a considerable extent, however, "disaster" is in the eye of the beholder, and as the perceiving eye changes, so too does the consciousness of what disaster is. Thus, in England between 1650 and 1850 natural hazards lost much of their threatening aspect and were supplanted by man-made disasters associated with industrial technology. That kind of cognitive-evaluative shift is only partially encompassed within definitions that lay overwhelming stress upon physical damage. Much more is involved; the sense of vulnerability, loss of control, and the availability of acceptable explanations of misfortune. I might add in this respect that geographers of natural hazards have proved far subtler and more resourceful than their colleagues in other disiplines.

Professor Smith obviously believes that the extension of "disaster" to certain culture contact situations, to war, and to economic dislocation is an unacceptable metaphoric extension. Yet if we look at the historic experience of catastrophe – a project to which William Langer unsuccessfully exhorted his fellow historians in 1958 – we find that two significant changes have occurred: First, natural hazards have come increasingly under human foresight and control; where they have not, the shock of their occurrence has been mitigated by the belief that they are in principle controllable. Counter to the decline of natural hazards, has come the rise of man-made disasters, of which the current literature on ecological and nuclear "doomsdays" is but the most conspicuous reminder. Second, the shift from natural to man-made disasters has been accompanied by a shift in the scale of possible catastrophe. Natural disasters reflected the rhythms of nature and occurred within recognizable spatial and temporal limits. Man-made disaster, by contrast, is far less likely to be in a form for which communal memory provides precedents, and is far less likely to observe spatial and temporal limits. Disaster research that fails to recognize these processes will, in my view, operate upon a steadily shrinking terrain.

Finally, I must confront that perennial bugbear, the charge of "psychologizing." In the first place, I thought I had made abundantly clear my distaste for crowd-mind models. The work of Kerckhoff and Back and of Trevor-Roper, to which I give considerable weight, is to my mind clearly distinguishable from the Le Bon school. Second, even a casual reader in the millenarian literature will be struck by the frequency with which examples of ecstatic behavior abound. The choice is between evading and confronting the problem of its occurrence; in choosing to confront it, I was necessarily drawn to an examination of individual factors. Third, the book deals with two major questions: What societal conditions give rise to millenarian movements? and, How do individuals behave once they have joined such movements? The former poses problems at a different level than the latter. Although he is less than crystal clear on the point, Professor Smith apparently supposes my discussion of disaster and my discussion of ecstatic behavior to be parallel, irreconcilable approaches to the single problem of millenarian emergence, when in fact they are separate answers to separate problems. Finally, Professor Smith has a way of tarring everyone with the Le Bonist brush: "Although he [Barkun] criticizes Le Bon and psychopathological explanations, his dependence on the disaster syndrome, ecstatic behavior, suggestibility, contagion, and leveling is somewhat contradictory." My surmise is that talk of the disaster syndrome makes Professor Smith uneasy. A segment of disaster research has always sought to play down problems of individual functioning and accentuate the capacity for adaptive response. My own reading of the literature suggests that those who deny the significance of the disaster syndrome have not looked for it; that those who have, find it widespread and surprisingly durable; and that disasters differ in their capacity to produce it. In any case, word magic will not forever exorcise it.

These brief comments do not exhaust my disagreements with Professor Smith. If my conclusions strain the literature for him, I hope they extend it for others.

A REPLY

Gilbert White

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Let us hope the volume will not be regarded as a bible, or its authors as Jobs bemoaning the toll of woe, or as apostles preaching the one road to a new life. It was intended to lay the groundwork for commentary and prophesy, but to be neither.

Its selection of study areas, as noted, was somewhat fortuitous, and the intent was to encourage individual authors to have their say in a moderately coherent framework. The research method was first tested in a cross-cultural research station in Yucatan, and thereafter was suggested to workers elsewhere with the admonition that they feel free to modify or depart as local conditions seemed to warrant. This they did without apologies. An attempt then was made to examine through field discussion and correspondence what went wrong and what brighter ideas emerged.

It was planned that "the results of the investigations of policy at regional and national and international levels" would be "contained in a companion volume (p. 4)." That volume has moved slowly but finally is in press. Likewise, since then a concrete examination of problems of translating hazard research results into specific behavior has been completed for one country (White and Haas, *Assessment of Research on Natural Hazards*, Cambridge: MIT Press, 1975). The bridge for which James Lewis rightly calls will require a good many stones; the Bradford group hopes to place some of them.

Mass Emergencies 1 (1976) 247
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EDITORIAL: INDIVIDUAL AND ORGANIZATIONAL RESPONSE TO THREAT

The articles in this issue represent a range in substantive focus, from stress in the wilderness, to hail-produced poverty, to response to earthquake predictions. They also represent all social units – the individual, the family, organizations, and society as a whole. Some of the articles deal with anticipated disaster, while others treat the consequences of large-scale disasters. Taken as a whole, these authors demonstrate that there is much to be learned from a broadened perspective on human aspects of hazards and disasters. Their work also suggests that there is a whole new generation of scholars who are applying their basic social science skills to the analysis of human stress in actual or potential emergencies.

Nielsen comes up with some surprises. Even in a wilderness setting most persons seem not to respond negatively to crowding. Some of the findings presented by Hutton are both unexpected and sobering. They suggest that perhaps many of the time-honored propositions about human behavior in warning situations repeated over and over in the literature may be weak reeds upon which to lean preparedness planning.

Bolin's work on long-term family recovery from natural disaster represents a style and model which many disaster researchers would do well to emulate. He describes a well-developed theoretical model for explaining family recovery and then puts it to empirical test using data from the Rapid City, South Dakota, flash flood of 1972.

The Trainer and Bolin paper is a rare contribution. In only a few instances in the past have researchers been able to conduct simultaneous research in two countries focusing on the same topic and using nearly identical methodology. There is much to be learned from their experience as well as their findings.

The Burgess paper takes a large step forward in our developing understanding of how organizations anticipate and respond to sudden changes in their environments. Her conceptual framework is intriguing and merits empirical testing.

In their article, Gillespie and Perry demonstrate how a careful analytical approach using a systems model, combined with an emergent norm approach, can lead to a classification of the processes and consequences of mass convergence on the scene of disaster impact.

The article by Farhar introduces an approach which is rare in the disaster literature. She treats the question, "What influences the response of the public to a new technology which offers hope for a disaster reduction in the losses from severe storms or other disaster agents?" The three case studies she presents suggests that the question has general relevance for disaster preparedness and that the answers will be quite complex.

Gimenez took on a very difficult task and carried it off in a scholarly fashion. She asked, "What can we learn from the 'experiment' in China with the developing science of earthquake prediction?" As will be seen, securing information on the events in China was most difficult. She uses, with care, data from all available sources, paints a fascinating account of events and processes in China, and then offers observations about how Western societies may wish to restructure earthquake prediction and hazard mitigation practices.

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CROWDING MODELS, STRESS, AND WILDERNESS*

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INTRODUCTION

The current environmental crisis might be simplistically described as a situation of dwindling resources in the context of rapid population growth. One of these increasingly scarce resources is physical space, and its relation to a nation's or community's overall quality of life has received considerable attention. Specifically, as both numbers and concentrations of people (e.g. through urbanization) increase, there is concern about the possibly negative, stressful effects of crowding.

Crowding simply means "too many" people in a given physical setting, and is measured either subjectively or by various signs of stress – e.g. lowered productivity, anxiety, aggressiveness, high crime rates, mental illness, etc. Generally speaking, a curvilinear relationship is hypothesized between density (number of people per unit of space) and quality of life. "Crowding" is represented by the combination of high density and low quality of life, while "isolation" is represented by the other end of the continuum – too few people for life enhancement. Somewhere in between these two extremes is "optimal" social density. But this optimal range varies widely because crowding is determined by more than just numbers of people or density. In fact, optimal density is implicitly defined in terms of the absence of stress. That is, only when certain manifestations of stress occur (usually at high density levels) is the situation described as crowded. In short, crowdedness is seen as one form of environmentally induced stress, and many writers, both scientific and popular, think the problem has reached an emergency level in some areas and is potentially problematic in others.

Efforts to measure the potentially stressful effects of density and subsequently develop optimal social densities for various situations have been made by environmental scientists from widely different perspectives. This body of research is of central concern for the development of social policy in urban planning, population growth, health administration, and wilderness recreation management. The purpose of this paper is to describe a composite theoretical model based on the crowding literature, and then show how a carrying capacity model, derived from outdoor recreational research, parallels and constitutes a more specific instance of the basic crowding model. Results of an empirical test of the carrying capacity model carried out in a unique wilderness setting are presented. Interpretation of findings from this study suggest some important modifications of the crowding model.

*The research reported in this paper was conducted under Contract #CX 821040104 with the National Park Service, Grand Canyon, Arizona. Any opinions, findings, conclusions, or recommendations expressed in this paper are those of the author and do not necessarily reflect those of the National Park Service. The author wishes to acknowledge the assistance of B. Shelby on this project.

CROWDING AS A STRESSOR

Most crowding models are elaborations of the basic theme that crowding is an aversive stimulus and results in psychological and/or physiological stress (see Figure 1-a). Development of this basic hypothesis has taken several directions (see Figure 1-b). First, most writers follow Stokols' (1972) lead in differentiating between crowding as a negative, subjective, experiential state and density (number of people per unit of space) as a physical, and relatively objective, variable. Density, as well as the absolute number of people in a given situation, are the major determinants of amount and type of social interaction. Total number (e.g. group size) is hypothesized to have an independent effect on perceived crowding insofar as it increases the potential number (and possibly rate) of social interactions.

The basic variable intervening between density and crowding is quantity and quality of social interaction, the usual assumption being that the two are negatively related – i.e. the greater the number of people, the less satisfactory the interaction. The direction of this relationship is evidenced by the social psychological concepts and mechanisms suggested as explanations for the link between increased social interaction and perceived crowdedness. These include "interpersonal press" (increased obligations yet reduced opportunities for interpersonal rewards) posited by Galle et al. (1972), information-overload (Milgram, 1970), information-

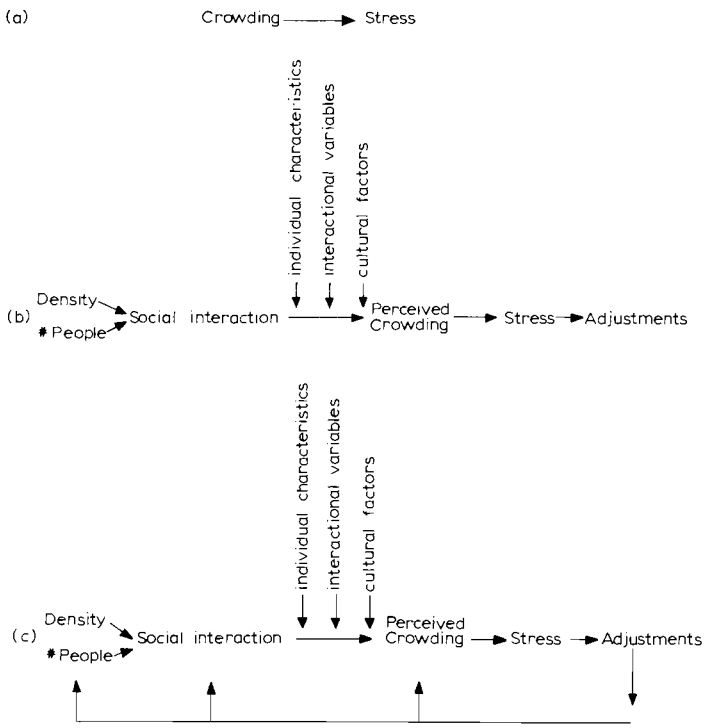

Fig. 1. Crowding model. (This model is based on both implicit assumptions and explicit statements found in the literature. Not all variables are included in all research studies, either empirically or theoretically. For example, the causal sequence implicit in Galle et al. (1972) is: density → interaction → stress. A "perceived crowding" variable is not included. Manderscheid (1975) on the other hand, argues that conscious definition of the situation as crowded is necessary for stress effects to occur. McClelland's (1974) model differs from the above in that crowdedness is equated with "excessive" social interaction; thus the need for an intervening social interaction variable is eliminated. She also included a "physical arrangement of people" variable as a determinant of crowdedness.)

processing and sensory-overload (Rapoport, 1975), intrusions of personal space and territoriality (Sommer, 1969), decreased freedom of choice (Proshansky et al., 1970), and the interference of others with goal attainment (McClelland, 1974). As McClelland points out, the obvious consensus is that "stressful" social interaction is one result of higher density levels [1]. A few writers, however, have emphasized the importance of the quality of the interaction, independent of its quantity (Freedman, 1975) and this has some empirical support. Stokols et al. (1973), for example, found that subjects doing cooperative tasks reported greater satisfaction than those doing competitive tasks, regardless of whether density was high or low.

Because crowding *is* socially defined, a variety of individual (e.g. sex, race, etc.), social, and cultural factors (e.g. norms) which can affect one's evaluation of the social interaction enter the model as mediators. These factors reflect individual, group, and cultural differences in the probability of defining the situation as crowded.

Once a situation is defined as crowded, the link to both psychological and physiological stress (Stokols, 1972; Manderscheid, 1975) is considered rather direct. Stress as the major dependent variable in most crowding studies takes a variety of forms. These include: (1) indices of social pathology like suicide, juvenile delinquency, crime, neglect of children, mental health disorders, mortality and morbidity rates, etc. (see Galle et al., 1972; Mitchell, 1971; Schmitt, 1957 and 1963; Marsella et al., 1970; Myers and Manton, 1974, for examples); (2) reactions at the group level such as decreased performance and interpersonal attraction; (3) subjective evaluations of the situation (e.g. feelings of hostility and aggression) (Freedman et al., 1971; Stokols et al., 1973); (4) behavioral reactions like aggression (Loo, 1972; Mackintosh et al., 1975); and (5) physiological reactions like electrodermal activity (Aiello et al., 1975), and high blood pressure (D'Atri, 1975).

As a reaction to stress, efforts to decrease social stimulation or make other adjustments to crowding are posited. Examples include attempts to change the number of people, enlarge the space, create architectural barriers to stimulation, obtain more resources, leave the situation and redefine rules to modify social interaction (McClelland, 1974). Manderscheid (1975) categorizes stress responses as either adaptive (e.g. modification of the setting, redefinition of the setting, interaction outside the setting, and movement to a new setting) or maladaptive (physical illness stemming from physiological stress and psychoneurotic symptoms). Rapoport (1975) offers numerous examples but, unlike others, does not specify their probability of occurrence.

The least developed aspect of the crowding model is seen in suggested feedback mechanisms between responses to stress (above) and other variables in the model (see Figure 1-c). It is hypothesized that reactions to stress caused by crowding will either (1) change the density, number and/or physical arrangement of the people, (2) reduce, limit, or order social interaction, or (3) result in a redefinition of crowdedness. But guesses as to which mechanism will occur under what conditions are still rather speculative. The potential effects of these mechanisms, however, is clear. Leaving the situation would effect a change in density. A redefinition of space, on the other hand, would bypass density but affect perceived crowdedness. The questions of which adjustment will occur and which temporally prior variables will be affected is important because some adjustments will result in changes in social organization but not density or numbers of people. The implications of this and related issues will be considered in the discussion section.

Empirical research on different parts of this basic model has been carried out at both macro (cities, census tracts, communities) and micro (e.g. small groups) levels; in both field (e.g. department stores, railroad stations,

psychiatric hospitals, aboard ships) and laboratory settings; and with both children and adults. Results from laboratory experimental research (Stokols et al., 1973; McClelland, in press) support the first part of the crowding model, that increased density leads to the perception of crowding, but only a few studies have measured the intervening variable, rate and intensity of social interaction. The link between crowdedness and stress, however, is tenuous at best. Empirical findings relevant to both simple and complex versions of the crowding model are reviewed elsewhere (Freedman, 1975; Lawrence, 1974; McClelland, 1974; Zlutnick and Altman, 1972). The lack of a clear, direct relation between crowding and stress (in humans) is evidenced by reviewers' conclusions. Freedman (1975), for example, argues rather strongly that no independent effects of density have been shown. Lawrence (1974) says:

> The field is confused by definitions, by conflicting data, and . . . by popular conjecture. The animal data are most easily interpreted and possibly of least use to man. The urban findings are inconclusive, demonstrating no unequivocal relationship between population density and social ills. Finally, clinical and experimental models are at odds, and the results of experiments are again inconclusive.
> Perhaps the only certain conclusion that can be drawn at this time is that there is no clear, demonstrable, linear relationship between high density and aberrant human behaviors, or between the social crowding of the individual and aggression.

McClelland (1976), somewhat more cautiously concludes that, "to the extent that crowding increases incoming stimulation and necessitates monitoring of and coordination with others, it will produce arousal, but not necessarily stress or negative affect."

CARRYING CAPACITY MODEL

Another area of research that is concerned with the effects of increasing numbers is that relating to recreational and wilderness management; but it has not yet been related to the body of theory and research on density and crowding described above. The question of acceptable use levels – numbers of people in a given recreation area at a given time – is particularly crucial in recreational settings because most management agencies (e.g. National Park Service, U.S. Forest Service, etc.) have the task of providing recreational areas while preserving the quality of the recreational experience. There is a potential contradiction in these goals to the extent that the number of people being served (i.e. the number engaged in recreation at any one time) reduces the quality of the experience. This is particularly true in the case of wilderness management, since wilderness is by definition an area of low density and low development. With increasing numbers of people using the nation's recreational facilities (Brockman and Merriam, 1973: 163, 167; Catton, 1972) concern for the quality of the wilderness experience has been expressed. There is strong normative demand for retaining low density in wilderness areas. If low density conditions are not met, it is assumed that people either have a "bad" experience or redefine it as a nonwilderness experience. This kind of reasoning is generally shared by managers and recreationists, as well as social scientists doing research in this area. (Cf. Nielsen et al., 1977, and Shelby and Nielsen, 1975, for a review of this literature.) The model, or set of relations assumed to be operating for recreationists in wilderness settings is shown in Fig. 2.

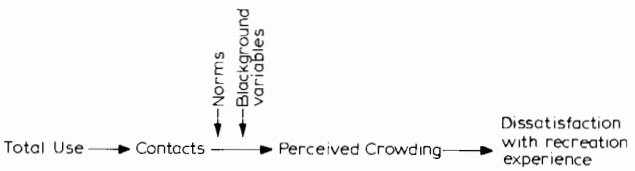

Fig. 2. Carrying capacity model for recreation areas

The model hypothesizes that the greater the total use level in an area, the greater the probability of meeting other parties. Intergroup contacts, along with other personal,

social and physical variables, then determine the extent to which people define the situation as crowded. Crowding, in turn, is seen as decreasing the quality of the experience; thus user satisfaction decreases with increased crowdedness.

A basic similarity between the carrying capacity and crowding models is evident. Total use, of course, is the equivalent of density, and intergroup contacts reflect the social interaction variable found in the crowding model. Perceived crowding is essentially the same and, as in the crowding model, is assumed to be affected by a host of normative, situational, and interactional variables, as well as actual contacts. Finally, satisfaction, a subjective evaluation of the wilderness experience, parallels the stress variable in the crowding model.

One might argue that crowding in a wilderness setting could never be "really" stress-provoking in the way that long-term crowding in a densely populated urban ghetto is. But as indicated earlier, the dependent variable in crowding models takes a variety of forms, and "stress" is used as a general term to describe negative, unpleasant experiences. As Lawrence (1974) put it, for most people crowding means "trouble." Furthermore, if we are to take seriously the hypothesis so often put forward in the literature and reflected in the crowding model, that crowding is a subjective experience affected by normative standards of density appropriate for different occasions, then it is possible to experience "crowdedness" in spite of extremely low levels of density. As Lawrence (1974) argues, three people can feel crowded if the normative constraints of the situation are such that three is a crowd [2]. At any rate, density is potentially independent of crowdedness, and if crowdedness is affected by norms, a theory of the effects of crowding should apply as well to low density crowded situations as to high density ones. Serious consideration of a normative component in determining "perceived crowding," then, leads one to argue that wilderness, socially defined, is a low density situation, and the threshold for reacting to crowdedness is low. Indeed, this low threshold (compared to urban settings) makes the wilderness situation an ideal one in which to test the crowding model. This is not to suggest that sociological and psychological potential for contact in the urban setting is unlimited. Rather, the argument is that, generally speaking, expectations about appropriate numbers of contacts in the wilderness are much lower than that for urban settings. Thus, the effects of increasing density should be clearly evident when that threshold is reached.

The wilderness context also provides a good test of crowding effects because some of the potentially confounding physical (noise, lights, heat) and perceptual (openness and visual escape) variables often associated with density (Carson, 1972; McClelland and Auslander, n.d.), are not present in the wilderness setting. Thus, effects of amount of contact, independent of other variables associated with density, should be more easily ascertained.

Finally, the wilderness setting is unique in that recreationists are usually engaged in a particular activity (backpacking, hiking, camping, river-tripping, etc.) that involves rather intense and special kinds of relations with the physical environment. Because of this, the importance of *intragroup* social interaction might be overshadowed by the importance of the physical environment. In addition, *intergroup* contacts that interrupt, impede or in other ways disturb the person-environment relationship, may be even more salient.

EMPIRICAL TEST OF THE CARRYING CAPACITY MODEL

A study designed to test the assumptions underlying the carrying capacity model described above was carried out during 1974 and 1975 [3] on Colorado River rafting trips through the Grand Canyon area. The Grand Canyon is an unparalleled natural area. The Colorado River flows through the Canyon for 280 miles from Lee's Ferry to the Grand Wash

Cliffs, and provides an incomparable outdoor whitewater experience. River trips through the Grand Canyon begin at Lee's Ferry, Arizona. The first point at which passengers can debark is Phantom Ranch, 88 miles downstream, but most go on to either Diamond Creek (mile 225, the first point where boats can be taken out) or Pierce's Ferry (mile 280). Motorized trips float the river on large (30–40 foot) pontoon rafts, and take between 5 and 11 days to traverse the canyon. Oar-powered craft are generally smaller (15–25 feet) and take a longer time (12–18 days to make the trip). At night, recreationists camp on natural beaches along the river. During the day, they travel on the river.

In addition to river travel, stops are made at visitor attraction sites. These are places of scientific, historical, or aesthetic interest. They include side canyons, tributary streams, waterfalls, swimming holes, etc. The number and length of these stops varies from one trip to another.

Compared to the duration or length of other situations in which crowding effects are usually studied, then, river trips fall between short-term laboratory situations, short-term field experiments, and long-term permanent living situations.

Procedure

During the 1974 and 1975 seasons, participant observers accompanied a sample of river trips through the canyon. During the trip, observers recorded information about contacts with other parties and other trip characteristics. Before the end of the trip, passengers completed questionnaires which were administered and collected by the observer. Information on use levels was obtained from the National Park Service records at the end of each river-running season. Data sources, then, include observers' trip reports, passengers' questionnaire responses, and National Park Service use records.

Measurement

"Use levels" refer to the number of people on the river during a specified period. Although all river trips begin at Lee's Ferry, they travel at quite different speeds, taking between 5 and 18 days to traverse the canyon. Fast trips, then, may encounter and pass trips that left several days before them, while slower trips are passed by those leaving later. For this reason, the measure of use level employed was total number of people or trips leaving Lee's Ferry during the week a given trip (in our sample) left. This 7-day period included the departure date and three days before and after it. During 1975 the number of people per week leaving Lee's Ferry varied from 80 to 950.

"Inter-group contacts" [4] are of two kinds, those taking place on the river and those occurring off the river at attraction sites. Their number, duration, quality (friendly, hostile, or neutral), were recorded.

Questionnaire responses included measures of perceived crowdedness, wilderness values, standard background variables, and user satisfaction with the experience. Wilderness values include endorsement of anti-artifactualism (i.e. against development of wilderness areas), attitude toward artifacts in the Grand Canyon, reported river-running experience, degree of participation in outdoor recreational activities, and mode of travel (i.e. motor or oar). Perceived crowding measures were divided into general perceptions (the whole trip) and specific evaluations of river, attraction site and campsite contacts. The user satisfaction variable is based on a rating of the overall quality of the trip from "poor" to "perfect."

Results

Data pertaining to the three basic relations specified in the carrying capacity model will be presented and then discussed in terms of their potential for modifying the crowding models presented earlier.

TABLE I

Correlations of Contact Variables With Use Level

Variable	Correlation With Use Level (People Per Week)
Trips per week	0.94
River encounters	
Contacts per day	0.68
Time in sight (minutes)	0.47
People per day	0.65
Attraction site encounters	
Percent of sites (total) w/contact	0.58
Probability of meeting another trip at:	
Little Colorado River	0.28*
Elves' Chasm	0.69
Deer Creek	0.43
Havasu Creek	0.31*
All four sites	0.58
Number of people met at:	
Little Colorado River	0.25*
Elves' Chasm	0.43
Deer Creek	0.26*
Havasu Creek	0.33*
All four sites	0.51

*$p < 0.05$
All other probabilities are less than 0.01

TABLE II

Variables Related to User Satisfaction

Variable	Correlation with Trip Rating*	
	1974	1975
Personal benefits		
Subjective learning	0.23	0.30
Personal Growth	0.15	0.19
Social aspects		
Quality of group experience	0.34	0.32
Rating of boatman	0.29	0.36
Easy to ask boatman questions	**	0.32
Wilderness character of the experience		
Perception of canyon as wilderness	0.20	0.10
Evaluation of trip as a "nature experience"	0.31	0.31
Perception of use impact (ecological)	–0.23	–0.19
Artifactualism (in Grand Canyon)	–0.18	–0.29
		–0.14
Weather bad	**	–0.22
Trip pace (leisurely)	**	0.28

*$p < 0.01$
**1974 data not available

As expected, probability of contact increases with use level ($r = 0.68$). For more detailed information regarding the relation of use level to probability of contact on and off the river see Table I. There was no relation between river contacts and perceived crowding ($r = 0.05$) and a low but significant correlation ($r = 0.12$, $p < 0.01$) between attraction site contacts and perceived crowding. It should be added that correlations between perceived crowding and contacts were not significantly different for respondents who measured high on several indicators of wilderness values, defined as wilderness "purists" by Hendee et al., (1968) and Stankey (1973). Finally, the correlation between perceived crowding and satisfaction is statistically significant but not substantively important ($r = -0.14$, $p < 0.01$).

In sum, results show a relation between density and contacts, but little effect of density on perceived crowdedness or of perceived crowdedness on user satisfaction. Factors that *were* related to user satisfaction are listed in Table II and include personal benefits, social aspects of the trip, and the wilderness character of the experience.

In short, our findings parallel those reported in other studies of crowding. *Density seems to have little or no effect on the overall rating of one's experience, but other variables like background characteristics and those relating to the kind and quality of the social interaction do.*

DISCUSSION

It was argued that the wilderness setting would be a likely test for density effects

because of the importance of low density norms. Yet, in spite of wide variation in the number of people on the river and its environs at any given time (use levels ranged from 80 to 940 persons per week) and a wide range in contact levels (from 0 to 9.5 per day), these had little effect on perceived crowdedness, and perceived crowdedness had little effect on subjective evaluations of the experience. Our argument, however, hinged on the importance of shared norms about use levels in wilderness areas. Since a high percent (90%) of the sample was composed of people on their first Grand Canyon river-running trip, it is possible that the assumption of normative standards for wilderness use held by these passengers was a false one. On examination of data relevant to the existence of such norms, it was found that a large proportion of the sample did not in fact have definitive ideas about what to expect in terms of contacts during the trip. Response to questions about *expected* contact are shown in Tables III and IV. As can be seen, 53% did not have an expectation about the specific number of contacts they would have and 36% said they did not know how many people they expected to see. For a good proportion of the sample, then, the situation was normatively ambiguous in terms of expected contact. This may explain the lack of relation between contacts and perceived crowdedness.

A second possible explanation for the lack of density effects has more significant implications for modification of the basic crowding model. Information from participant observer forms and ethnographic field notes support the idea that certain informal mechanisms are operating on the river scene to keep some kinds of contacts at a minimum. We asked participant observers to collect data on the number of times "adjustments for crowding"

TABLE III

Number of River Contact Expectations

Percent response to item, "How many parties per day did you expect to see while floating on the river?"								
NONE	1	2	3	4	5	6–10	11–20	Did not know what to expect
10(93)*	6(60)	11(105)	6(61)	4(39)	4(39)	4(37)	1(12)	53(495)

N = 942
*Figures in brackets represent the number of cases

TABLE IV

Number of People Expected to See Relative to Number Actually Saw

Percent response to question, "Overall, how many people did you expect to see during your trip?"			
Less than you actually saw	about as many as you actually saw	more than you actually saw	did not know what to expect
25(243)*	27(259)	12(115)	36(349)

N = 966
*Figures in brackets represent the number of cases.

were made. Two examples are relevant here. The boatmen, as trip leaders, have some control over the day's scheduling, travel pace, number and location of stops, etc. It was observed that communication between boatmen of different parties often centered around arranging each party's campsite for the night. One of the first (and sometimes the only) question boatmen asked each other was where their party was planning to camp for the night, and agreement that each party would use a different campsite was usually reached. This sometimes involved traveling farther and/or faster than planned, slowing down, or simply changing the location of the planned campsite. But all these maneuvers seemed to be an enforcement of the current river norm that only one party camp on a given beach.

A second example of behavioral adjustments for crowding occurred whenever boatmen passed up attraction sites that were already occupied, as evidenced either by number of people or boats on shore. This occurred more often for minor attraction sites, i.e. ones that could be passed without passengers becoming aware that they had missed something. But for major attraction sites that are either very visible or well known (e.g. the Little Colorado River, Deer Creek Falls, Havasu), this was less possible. As a consequence, higher contact probabilities occurred at these sites (see Table I). Overall, the relation between density level and adjustments for crowding was significant ($r = 0.24$); the relation between contacts per day and adjustments for crowding was even stronger ($r = 0.47$).

The importance of these "adjustment for crowding" behaviors is that they occur either prior to or during contacts, and that they reduce the probability of later, more prolonged contact. Findings from other research studies also suggest the existence of density-mediating processes. Stokols et al. (1973), for example, found that groups in smaller rooms (high density) laughed more than groups in the larger rooms (low density). They interpreted this as a possible stress-reducing mechanism that could explain the lack of density effects on other dependent variables. Baum and Greenberg (1975) found that subjects who were convinced that crowding was imminent chose more socially isolated seat positions, avoided contact with others, experienced crowding and discomfort, and generally behaved in ways that could be defined as density-mediating. Kessler's (1966) research with mice showed that under extreme conditions of crowding they showed no increase in pathology once the population had achieved its maximum density and no further population growth was occurring. Under stable growth circumstances pathology was no more frequent than in the uncrowded control group. During the phase of rapid population growth that preceded this plateau, disease was more frequent than in the control group. It seems, then, that the mice had "adjusted" to higher density levels. Finally, results from observational studies of children in free play situations show that increased density results in lowered rates of interaction. The avoidance of interaction could be interpreted as a mechanism of psychological adjustment to high density (McClelland, 1974).

These examples are interesting in light of Freedman's (1975) remark that the lack of crowding effects is not a question of adjustment because there is no sign that any stress has occurred in the first place. His assumption, like others, is that adjustments come after stress. But our results and those cited above suggest the possibility, at least, that adjustments come prior to stress, in anticipation of contact, and that they reduce the probability of interaction. If this is the case, and future research will have to bear this out, then the next question is how soon after an increase in density are adjustments made? And how much of an increase in density is required to stimulate these mechanisms?

CONCLUSIONS

Results from research testing the crowding-stress hypothesis in a wilderness setting are similar to those found in other settings. Specifically, crowding does not cause stress in the form of decreased satisfaction with the river trip. Several conclusions are warranted. First, it would seem that norms regarding appropriate density levels for different settings are probably more important than the amount of research attention given them thus far would indicate. No other research studies that we know of have ascertained expectations about density levels either before or during the situation being experienced. Rather, most experiments ask whether the subjects felt crowded, after the experience, on the apparent assumption that norms existed ahead of time and were operating to help determine whether the situation is defined as crowded. Furthermore, it would seem that when no specific or definitive density norms for a given situation exist prior to the experience, they might be developed *during* the experience. It may be, for example, that our subjects endorsed the one party per campsite rule because that is what they experienced. Whatever density level one encounters, then, might be defined as "normal" and therefore acceptable, and this might explain why reaction to high, medium, and low levels of contact did not differ for our respondents.

If the development of crowding norms for other settings (e.g. urban ghettos, department stores, etc.) also occur "on the scene," so to speak, this would explain the lack of a "crisis" orientation by people constantly exposed to high density. One result of norm development or even shifting norms based on actual experience rather than "optimal" environments might be that people (or users) do not define situations as "emergencies" even though experts (or purists) do. Behaviors that essentially ignore warnings of potential disaster – like building homes on flood plains or discounting hazard warning signals – might be relevant here. As Dubois (1973) has suggested, perhaps human adaptability which facilitates adjustment to what appear to be unpleasant environments in the short run will be detrimental to the species in the long run.

A second conclusion is that there is some evidence that adjustments for crowding occur earlier than is suggested by the crowding model. Rapoport's (1975) extensive list of density-mediating effects (which includes physical arrangements that reduce interaction like doors, curtains, etc., the development of social rules to reduce social interaction, and psychological mechanisms like withdrawal), illustrates the diversity and widespread occurrence of these mechanisms. In animals, density-regulating mechanisms seem to occur partly as the result of physiological stress (Wynne-Edwards, 1965). But density-mediating mechanisms may occur in human interaction situations much earlier than previously thought, thus explaining the lack of stress effects in density research. If this is the case, then sociological organizing mechanisms and psychological perceptual processes take on a new importance. Density, number of people, and physical arrangements of people may provide the necessary but not sufficient conditions for "crowdedness," while social interaction and its organization determine whether crowdedness will occur.

NOTES

1 The tendency to attribute less rewarding interaction to higher interaction rates is most evident in descriptions of crowded urban slum areas. The implications seem to be that with so many people, one will not get much attention from significant others and yet be exposed to more social presence than wanted. The opposite hypothesis – that the presence of others results in positive interaction and facilitates goal attainment – is possible, probable, and evident in everyday social life but often only grudgingly acknowledged by environmental social scientists writing in this area.

2 Lawrence (1974) carries to its logical extreme the argument that crowdedness is an intrapsychic phenomenon, arguing that "the imagined presence of others" by a

hallucinating person could be called crowdedness. We prefer to underscore the impact of crowding norms that are attached to social situations. Otherwise, the physical variables (density, number of people, and their arrangement in space) become totally unrelated to the rest of the variables in the model. One is left with a model of social interaction rather than one of crowding.

3 The 1974 research was a pilot study based on a purposive sample of 11 trips. The 1975 data represent results from a representative sample of 50 river trips for the season. With some exceptions, results from both years show strikingly similar patterns.

4 It should be noted that intragroup as well as intergroup interaction exists and possibly influences the perceived crowdedness of the situation. Recreation research shows that most people visit recreational areas with a small group of primary acquaintances (Hendee et al., 1968). Occasionally, of course, larger, more formal groups like girl scouts and hiking clubs are the social medium for wilderness or outdoor recreation. But in general, one of the purposes or motives for engaging in wilderness recreation is to seek "solitude," which means low intergroup interaction but not necessarily minimal intragroup interaction. River trips, compared to other forms of recreation, are somewhat unique in that (1) they are generally larger (group size ranges from 15 to 40) and (2) the degree of previous acquaintance among group members varies. They can be composed of people who knew each other before the trip, people who were strangers before the trip, and, of course, mixed groups. After spending several days camping, eating, and hiking together, a sense of group identity usually develops. We feel justified in defining people in each group as a unit which comes into various degrees of contact with members of other groups. In short, we are defining social interaction as intergroup contact rather than intragroup contact. The latter may affect user satisfaction, but its effect is presumed to be independent of density. The former is presumed to increase with total use.

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THE DIFFERENTIAL DISTRIBUTION OF DEATH IN DISASTER: A TEST OF THEORETICAL PROPOSITIONS*

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INTRODUCTION

Repeatedly, persons engaged in disaster research have expressed concern over the need for causal studies of behavioral response to extreme events (Mack and Baker, 1961; Dynes et al., 1967; Barton, 1969; White, 1974; and Mileti et al., 1975). Mileti et al., 1975, is the most recent compilation of what is known about human behavior in natural hazards and disasters. The authors have summarized the published literature, and conceptualized the findings in a manner which encourages causal analysis.

Concern regarding the dearth of specific research attention to older persons in disasters has been most recently expressed by a group at the University of Nebraska at Omaha (Gerontology Program, 1976). This is the most comprehensive study of the impact of disasters on the elderly yet published. The works of Baldi (1974), and Poulschock and Cohen (1975) are examples of research concerned with older victims. The focus of these efforts was service needs of older persons after the damaging flooding associated with Hurricane Agnes. This body of literature reports that older persons are victimized by disasters in greater proportions than other persons.

A fact which has consistently emerged from the statistics on disasters is that older persons die in greater numbers than would be expected from their proportionate distribution in populations affected by the disaster (Friedsam, 1962; Trainer and Hutton, 1972). Several hypotheses which could help to explain this phenomenon have been constructed and reported in the literature of disaster research, but few have been systematically tested. Five variables were selected from disaster literature to help in examining how it is that older persons are more likely to die in disasters.

DEATH AND AGE IN DISASTER

Friedsam's article, "Older Persons in Disaster" (1962), notes that according to the limited data available, "casualties do not occur at random in age terms but that the young and the old, particularly the latter, become casualties with far greater frequency than their numbers in the impact populations would lead one to expect" (p. 164). He cites his own analysis of deaths in Cameron Parish, Louisiana, from Hurricane Audrey in 1957, and that of Wallace (1956) for the Worcester tornado of 1953.

Friedsam utilized the age distribution of the white population of the parish, as presented in the 1950 Census, to compare to the age distribution of deaths in the parish. He found that

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for those between the ages of 10 and 59, the percentage of casualties was less than the percentage of people in that age range. The percentage of children who died or were reported missing was slightly greater than the percentage of children in the parish, and the percentage of casualties aged 60 and over was considerably greater (Friedsam, 1962: 165).

Trainer and Hutton (1972) report that for the Rapid City flood of 1972, 27.2% of all known-age dead were aged 60 and over. This percentage is in line with Friedsam's findings on Hurricane Audrey and with Wallace's calculations for age and death in the Worcester tornado (Friedsam, 1962: 165–166). However, when the calculation is refined for Rapid City (in order to compare the population with the available sample) by tabulating only those victims whose residence was in the flood plain and within the city limits, the percentage of known-age dead 60 years old and over is 46.34% (see Table I).

TABLE I

Flood Deaths Among Rapid City's Flood Plain Residents by Age

Age	% Distribution of flood plain population	% Distribution of flood plain deaths	% Difference population to deaths
0– 9	18.39	17.01	+ 1.38
10–19	16.39	4.88	+11.51
20–29	19.23	6.10	+13.13
30–39	9.53	4.88	+ 4.65
40–49	9.20	8.54	+ 0.66
50–59	11.20	12.20	– 1.00
60–69	10.03	19.51	– 9.48
70+	6.02	26.83	–20.81
	100	100	

(Adapted from Trainer and Hutton, 1972)

Table I also shows that the percentage of casualties among the very young was just slightly less than would be expected by their proportion in the population. This fact runs counter to Friedsam's idea that the very young are disproportionately victims of disasters. The percentage of mid-aged victims (10–59 years) is about half (37%) that of their presence in the affected population (66%). Vulnerability to death dramatically increases with age 50. For persons 70 years and older chances were 1 out of 5 that death would occur for those caught in this late-night, fast-onset, flash flood.

PROCEDURE

Death among older persons in the Rapid City flood plain occurred disproportionately. Does the present literature of research on disasters provide the explanatory variables to help explain why?

Hypotheses

Figure 1 synthesizes the hypothesized relationships to be examined. They derive from propositions found in a summary of behavior in disasters (Mileti et al., 1975: 42–52). The seven relationships are numbered in the diagram to correspond with the propositions presented below. The term "older persons" refers to persons 60 years and older. "Younger persons" are 59–16 years (16 being the age of the youngest respondent in the study).

Propositions:

1 Persons who receive warning of impending threat are more likely to evacuate than persons who do not receive warning.

2 Older persons are less likely than the young to receive warning of impending threat.

3 Older persons are less likely to evacuate prior to impact than younger persons.

4 Persons who have had severe flood experience in their past are more likely to evacuate (when warning is received) than persons who have not had severe flood experience.

5 Older persons are more likely to have had severe flood experience than younger persons.

6 The greater the perceived time before impact, the less likely it is that evacuation will occur.

7 Older persons are more likely to perceive a longer time to impact (upon receipt of warning) than younger persons.

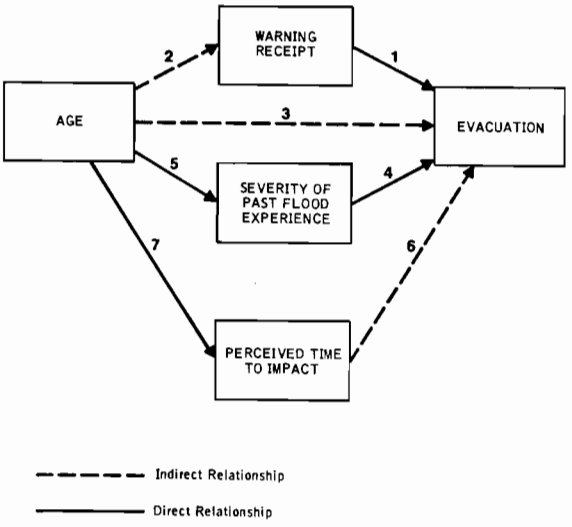

Fig. 1. Hypothesized relationships considered.

Data

The data [1] were derived from face-to-face interviews with 189 respondents who were drawn in a 1:8 systematic random sample of flood plain dwellings within the city limits of Rapid City, South Dakota (Mileti, 1974: 77–81), as of June 9, 1972, the day of the flash flood.

The primary aim of that study was to ascertain response to warnings prior to the onset of the destructive flash flood of 1972. Five households originally drawn for the sample were homes of persons who died in the flood. In the study of death in disaster, this obvious bias will always be present.

Analysis

Chi-square tests of significance, and contingency coefficients were calculated for the hypothesized relationships.

FINDINGS

The hypotheses considered will be restated, and the findings about each then discussed. Table II summarizes the set of results from chi-square analysis for all the hypothesized relationships.

1 Persons who receive warning of impending threat are more likely to evacuate than persons who do not receive warning.

To state the obvious, except by chance, pre-impact evacuation could not occur if warning was not received. Of course, some persons will perceive environmental cues as sufficient reason to take protective action, for example, putting their car under cover when the sky looks like hail might be coming. As would be expected, receiving warning is significantly related to evacuating. This relationship holds for older persons as well as younger persons.

2 Older persons are less likely than the young to receive warning of impending threat.

3 Older persons are less likely to evacuate prior to impact than younger persons.

In examining the relationship between old age and higher death in disasters, previous research suggests that older persons die in greater numbers because they do not receive warnings as frequently as younger persons (Friedsam, 1962). This was not the case with the Rapid City flood. There was no significant difference by age for receiving warning. Older persons were only slightly less likely to receive warnings than younger persons.

Past research has shown that, assuming warning was received, older persons are less apt to evacuate than younger persons (Friedsam, 1962; Moore et al., 1963). In Rapid City there was no significant difference by age for evacuation. About half of the persons who received warning evacuated prior to impact. When older persons received warning, they were slightly more likely to evacuate.

The relationships between age, warning receipt, and evacuation in Rapid City do not help explain the relative vulnerability of older persons in that disaster.

4 Persons who have had severe flood experience in their past are more likely to

TABLE II

Summary of Relationships Between Variables

Relationship	X^2	Significance level	Contingency coefficient
1 Warning receipt to evacuation	5.29	0.035	0.190
2 Age to warning receipt	1.02	NS*	–
3 Age to evacuation	0.0017	NS	–
4 Past flood experience to evacuation	6.76	0.035	0.264
**5 Age to past flood experience			
for persons 60 years +	0.418	NS	–
for persons 16–59	6.342	0.02	0.306
6 Perceived time to impact to evacuation	5.593	NS	–
**7 Age to perceived time to impact			
for persons 60 years +	0.270	NS	–
for persons 16–59	5.322	0.02	0.212

*NS indicates no significance at the 0.05 level
**Three-dimensional chi-squares were derived for Relationships (5) and (7).

evacuate (when warning is received) than persons who have not had severe flood experience.

5 Older persons are more likely to have had severe flood experience than younger persons.

Past research indicates that people tend to define some potential impact in terms of prior experience with that disaster agent (Drabek and Boggs, 1968). Severity of prior flood experience was used here to test this idea.

There is an important relationship between age, severity of prior flood experience, and evacuation, as indicated in Table II. Only half of those interviewed had previous flood experiences and, of those who had, two thirds had experienced little severity.

Those persons who had prior severe flood experience were more likely to evacuate than those who had not (C=0.264). This association is stronger for younger persons (C=0.306); the relationship is not significant for older persons (C=0.119). Older persons were no more likely to have had previous severe flood experience than younger persons. Evacuation was more likely for older persons who had had previous severe flood experience, but the absence of such experience did not interfere with evacuation.

While prior severe flood experience enhanced evacuation for younger persons, that experience is not associated with evacuation for older persons. Current theory indicates that persons tend to act appropriately according to their previous experience with a given hazard. Previous hazard experience can, therefore, serve as a hindrance to actions adaptive to the new (perhaps more severe) threat. The subjective interpretation of what is "severe" impedes precision in measuring this concept. While this analysis did not help in that specification, the task of developing a more objective measure of severity should not prove difficult.

Another subjective perception which has been shown to be related to adaptive response is the perceived amount of time [2] before impact (Mileti et al., 1975).

6 The more time before impact persons perceive, the less likely it is that evacuation will occur.

7 Older persons are more likely to perceive a longer time to impact (upon receipt of warning) than younger persons.

As with flood severity, the association between perceived short time and evacuation was significant for younger persons (C=0.212), and very low for older persons (C=0.085). There was no significant relationship for the sample as a whole (C=0.189). Older persons more often perceived less time before impact than younger persons, but the time perception did not necessarily result in preimpact evacuation. Perceived short time before impact was more common among older persons. While perceiving a short time to impact was associated with evacuation for younger persons, this association was absent for older persons. The most immediate explanation for this difference is that, on the whole, older persons may take longer to evacuate (having made the decision to do so) than younger persons simply due to physical or opportunity limitations.

To recapitulate, seven relationships were examined in accordance with propositions from current disaster literature. Warning receipt was significantly related to evacuation, as expected. Prior severe flood experience was significantly related to evacuation for the population as a whole, and for younger persons (16–59 years). This experience measure was not related to evacuation for older persons (60+ years). Perceived short time before impact was significantly related to evacuation for the younger group, but was not related for older persons.

There were two important negative findings. In Rapid City there was no significant relationship for either age and warning receipt or for age and evacuation. These two findings run counter to common threads in the literature.

CONCLUSIONS

Some of the studies which have examined the reasons for the higher casualty rate among older persons have hinged their explanations on psychological differences; attachment to objects, preoccupation with time, and information processing, to account for "reluctance to leave" (Friedsam, 1961).

Other studies offer sociological explanations. Drabek and Boggs (1968), in their study of families and disaster in the Denver, Colorado flood of 1965, found that if older persons have a place to go, e.g. have relatives in the area, they are just as willing to leave as anyone else.

The basic contribution of this study in explaining the relative vulnerability of older persons in disasters is that it negates some commonly held notions about the relevant explanatory relationships. These data indicate that older persons are as likely to leave, given warning, as others, regardless of other factors. The results suggest that disproportionate death for older persons occurs among that segment of persons who *do not receive warning.*

Another finding of this study is that, in Rapid City, older persons were as likely to receive warning as others. It can be said, then, that for those persons who do not receive warnings, it is the old who cannot withstand impact. It is at the time of impact that disproportionate victimization of older persons occurs. If time of impact is the point in time which renders disproportionately higher numbers of older victims, then psychological explanations will not be helpful in formulating policies to minimize the inequity.

Instead, the results support the explanation that it is the differential distribution by age of relative strength, good health and physical capabilities which account for the old age and death in disasters relationship. If this idea has any strength in explaining the relationship, then natural disasters which occur without prior warning should take an even larger toll of older victims.

The Gerontology Program report says, "Ultimately, however, one must have the resources (e.g. health, transportation, knowledge, etc.) to exit a disaster situation. The evidence to date would suggest the elderly to possess fewer of these factors than any other age group." (1976: 11).

Since producing policy-relevant findings is one aim of research about disasters, these results point to the need for much more work in theory testing. Studies of disasters must employ representative samples so that more sophisticated analysis can do a better job of testing theory. In the current rudimentary

stage of disaster behavior theory development the publication of negative findings is useful, and must be encouraged.

NOTES

1 The data were collected for a study conducted as part of the research "An Assessment of Research on Natural Hazards," Institute of Behavioral Science, University of Colorado, with funds from the National Science Foundation (RANN, GI 32942), (Mileti, 1974, 1975; White and Haas, 1975). Any opinions, conclusions or recommendations herein do not necessarily reflect the views of the National Science Foundation.

2 There was 1 hour and 45 minutes between the time of the first urgent public media warnings for Rapid City and the time the flood hit the city (Mileti, 1974). Respondents' answers were coded as either "less than one hour" (a short period), or "one hour or greater."

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FAMILY RECOVERY FROM NATURAL DISASTER: A PRELIMINARY MODEL

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INTRODUCTION

When families are stricken by natural disaster, complex processes occur that affect all aspects of family behavior from the receipt of warnings to recovery in the aftermath. The extent of sociological knowledge about family behavior in stress situations is varied, with the greatest paucity in findings occurring in the area of long-term recovery (e.g. Mileti et al., 1975). The current research reported here examines systematically the relationships between factors that affect how families readjust over the long term after a stress event.

Much of the literature on natural disasters focuses on the activities of various social units during the immediate pre- and postimpact periods. While a small part of this literature, insofar as it pertains to families, will be reviewed, more attention will be given to a recent study conducted by Drabek and others (1973, 1975, 1976) in Topeka, Kansas. Their research is one of the first rigorous studies to focus on the long-term impact of disasters on primary groups, and such is salient here.

Data for this analysis were gathered in Rapid City, South Dakota following a catastrophic flash flood. Analytically, two statistical techniques are used to develop a family recovery model from these data. Relationships between variables in the model are evaluated in light of other findings in the literature.

The descriptive model presented here is a step, limited both in scope and generalizability, toward developing a general, comprehensive theory of familial recovery from natural disaster. No overarching theoretical framework presently exists in disaster research (Mileti et al., 1975) for the integrating of findings. Consequently, the current analysis stands as an example of a "middle range" (Merton, 1968), theoretical model, inductively developed and grounded in general social systemic notions of the relationships of families to other locality-relevant social structures (Warren, 1963).

FAMILIES IN DISASTER: A REVIEW

The greater part of disaster research has focused on complex organizations, the community, or individuals with the family as a unit being given only cursory attention. More recent studies (e.g. Drabek and Boggs, 1968; Drabek and Stephenson, 1971), have concentrated on interactional processes in families, specifically in familial response to warnings and evacuations. Some of the literature on warnings and evacuations, insofar as it concerns families, is reviewed before considering research on long-term family response to stress.

Warnings and Evacuations

The primacy of family roles in natural disasters has been axiomatic to most disaster research (Hill and Hansen, 1962:88). Research findings coming out of the Holland floods of 1953 emphasized the importance of the family as a major evacuation unit (Instituut voor Sociaal Onderzoek van het Nederlandse Volk Amsterdam, 1955:165). When families are not allowed to remain together, as in the Canvey Island, Great Britain evacuation, intense anxiety emerges in the separated families (Young, 1954:383).

Clifford, in his cross-cultural comparison of two border communities and their response to a flood on the Rio Grande, illustrates the salience of kinship structures as a determining factor in a family's responses to warnings of of an impending disaster. In Piedras Negras, Mexico, in which extended kinship patterns were characteristic, evacuation decisions were made in consultation with relatives (Clifford, 1956:117). In Eagle Pass, Texas, families indicated that evacuation decisions were dependent on interaction with immediate friends and neighbors.

Other studies of family response to warning and evacuation (Bates, 1963; Moore et al., 1963) emphasize the primacy of the family unit as a locus for decision making regarding impending disasters. If possible, evacuees seek refuge with relatives whose homes are outside the area of imminent danger (Moore et al., 1963:57). This is mediated by an age factor. Families in later stages of the life cycle (Cavan, 1974) are less likely to evacuate as far from the threat area as younger couples are. Bates (1963:13) notes that of families who do not evacuate, many go to other relatives' homes within the impact area to weather out the storm in "the security of the kinship circle." Evacuating families, if they go to official evacuation sites, tend to recluster in patterns duplicative of their old neighborhoods (Bates, 1963) indicating an intention to restore the familiar in the midst of unfamiliar surroundings.

Restoration and Recovery

According to Mileti et al. (1975:108), research findings on families in the postdisaster rehabilitation stage are clustered around two general themes: family behavior in emergency quarters, and variations in family relief needs based on their demographic characteristics.

Stoddard (1961) found that females have a more difficult time readjusting roles in emergency quarters than do males. Black families are said to adjust better to the demands of living in "communal" shelters than do white families (Kutak, 1938:65).

In terms of family relief needs, black families (Moore, 1958) and families with aged members (Moore, 1958) tend to need greater extrafamilial recovery aid than younger or higher socioeconomic status families. Relief needs are generally proportional to the extent of the impact of the disaster agent on a family's resources. In Moore's (1958:96) study of a town lightly damaged by a tornado, 76% of the victims received *no* aid outside the kin network. Victims in a more severely damaged town required a far greater amount of extrafamilial aid (74% vs. 24%), than those in the lightly damaged town (Moore, 1958:96). In the same study it was found that white families were more likely to receive aid from multiple sources than were black or chicano families (Moore, 1958:150).

A related but limited set of findings deals with families in the recovery phase of a disaster. Recovery entails a process of reestablishing homes and readjusting intrafamilial roles to the new postdisaster social milieu. Several researchers have reported an increased level of familial or primary group solidarity as a result of a family's shared experiences in a disaster (Fritz, 1961; Bates, 1963; Crawford, 1957). These findings are of limited generalizability and it is likely that under many conditions disasters may have dysfunctional consequences for family solidarity.

The extent and success of family readjustment depends on such variables as the demo-

graphic characteristics of the victim family and the severity of the impact on the physical well-being of the family. Crawford (1957:290) has found that large families with a disproportionate number of females have the greatest difficulty readjusting after a disaster. The loss of life or physical handicapping of a family member can cause problems in the reallocation of roles in the stricken family as well as in the adaptive responses of families to increased financial demands.

The necessity for families to find new housing, particularly if they are forced to relocate outside their old neighborhoods, compounds readjustment and recovery troubles of victim families. Dacy and Kunreuther indicate (1969:42) that families try to relocate with family or friends and, if possible, to return ultimately to their own home. In fact, the desire for families to return to their old homes is a recurrent theme in disaster literature (Instituut voor Sociaal Onderzoek van het Nederlandse Volk Amsterdam, 1955; Bates, 1963; Barton, 1969). The family, as an intimate environment (Skolnick, 1974), requires the privacy of a home to confront the traumas and disruptive experiences precipitated by an extreme event. In contrast, we have found that in the case of catastrophic disasters, many families do not seek to return to a site they associate with a traumatic event.

To most accurately assess the processes by which a family recovers from a disaster and to determine the long-term impacts of a disaster on family and kin, a longitudinal research design is a necessity. Until very recently such a design has not been utilized. Drabek and others (Drabek and Key, 1975; Drabek et al., 1973, 1975) have recently analyzed longitudinal, including preimpact, data on victim and nonvictim families in Topeka, Kansas, in a quasi-experimental research design. Their primary concern was to assess the long-term consequences of a disaster on inter- and intrafamily functioning. Several of their conclusions are salient to this research and will be reviewed.

Drabek and Key (1975:20–22) found that among the most important linkages of the family with extrafamilial units are ties to kin. The link of the nuclear family to kin is strengthened over the long run in the post-disaster community. This particular primary group linkage is suggested (p. 22) to be a facilitator of family recovery. Further, the authors suggest that linkages between the victim family and other relevant social units that were extensive and active prior to the disaster tended to become more so while those that were weak "were weakened further" (P. 22).

Elsewhere (Drabek et al., 1975:491), the primacy of kin ties in both the immediate emergency period and in the long run has been affirmed. As Moore (1958), Drabek found a high incidence of kin-based aid in the recovery process. This was true even for families who had tenuous preimpact kin ties. Also, the importance of kin ties in the recovery process was found to hold across sex, age, ethnicity, education, income, and religious categories (Drabek et al., 1973:491).

The preceding review has raised several issues of general theoretical and empirical importance to the sociology of the family. These will be noted before considering a causal model of family recovery.

Disaster Research and the Sociology of the Family

There are two crosscutting themes emerging from disaster research as it pertains to the family: (1) the relative importance of kinship linkages, and (2) the loss of family functions.

That the importance of kin relationships has decreased in the postindustrial West has been established (Parsons, 1943; Stephens, 1963). However, due to a general misunderstanding of Parsons' formulation (1943; Parsons et al., 1955), the American nuclear family came to be thought of by some researchers as "isolated." While Parsons' con-

ceptualization entails familial isolation in space (Parsons et al., 1955: 11), and not socially, this distinction was ignored generally. The findings of various researchers in disaster-stricken communities have emphasized the importance and functional nature of kinship ties. While, in a cross-cultural sense, the American kinship system is less elaborate than many, in situations of collective stress (Barton, 1969), primary group linkages become increasingly important.

In the last twenty years the importance of kinship in the United States has become an object of research interest (cf. Sussman, 1953, 1959, 1962; Litwak, 1960; Adams, 1968; Babchuck, 1971). While these studies all point to the continuing importance of kin networks in the United States, their varied emphases have made integrating the findings difficult (Drabek et al., 1975: 481). Thus, while the data do indicate the salience of kin linkages to nuclear families, they are not conclusive.

Disasters represent a special case in which kin relations, whether "dormant" or active before the event, become activated or heightened afterwards (Drabek and Key, 1975). After a disaster, victim families tend not to be isolated either socially or physically. Implicit in this is the issue of the functions of the nuclear family. Families stricken by natural disasters become dependent not only on kin, but also on local, state, and federal agencies for financial aid, food, emergency shelter, and temporary housing. In this sense, disasters cause families to lose some of their functions to formal organizations in the community (Bates, 1963).

The theoretical underpinnings of the notion of the "defunctioning" of the family have been presented by Parsons et al. (1955: 9). As societies become complex and structurally differentiated, the component structures (including the family) become increasingly specialized. In this way the family has lost part of its socialization function, its production function, and others, to nonkinship institutions. That disasters precipitate further loss of function for the family is true in a limited sense. Disasters may also increase the importance of the family for the well-being of its individual members.

The protective or security function of the family becomes heightened during disasters and provides important contributions to the psychological well-being of victims. This contention is supported by the incidence of extreme anxiety in families that are separated during disasters (Young, 1954; Instituut voor Sociaal Onderzoek van het Nederlandse Volk Amsterdam, 1955; Dacy and Kunreuther, 1969). In disasters, families give up certain functions to community. This is apparently balanced by the heightened importance of the family as an environment for individual protection and security.

To summarize, several points should be reiterated. Disasters cause victim families to utilize extrafamilial linkages to augment their recovery capacities. The number of systemic linkages a family has in a postdisaster situation determines "in large part" the family's capacity to recover (Drabek and Key, 1975: 27). Families in disaster situations are neither isolated socially nor without important functions. While kinship and community aid is important in determining the speed and extent of familial recovery, the extent of their contributions has not been systematically assessed. The remainder of this paper will consider the 1972 flood in Rapid City and the nature of family recovery from that event.

THE RAPID FLOOD

Impact

On June 9, 1972, a flash flood of massive proportions swept through the community of Rapid City, South Dakota. Two hundred and thirty-eight persons were killed and 1,300 families left homeless, with property damage reaching $ 100 million. Mobile homes parked

along Rapid Creek were tossed around like match boxes. Sturdy brick homes were swept off their foundations and wood frame homes were splintered. Whole blocks of neighborhoods were eliminated and hundreds of houses received extreme mud and water damage, although they withstood the deluge. A housing shortage in Rapid City was exacerbated by the disaster. Shelter had to be found for the dispossessed as well as food and clothing. Massive federal intervention was forthcoming in the form of Small Business Administration (SBA) loans, a $ 48 million urban renewal project to clear a floodway, and mobile homes for temporary shelter. Also, organizations were formed to distribute donations to flood victims.

Many victim families were forced to relocate as a result of the floodway clearance project, while those who remained in their preflood homes often spent the following year cleaning up the detritus of the flood. Neighborhoods were disrupted as families moved to new and disparate areas in the town. The cataclysmic nature of the flood left many traumatized by the event, enough to spur the formation of a "mental health steering committee" to start an intervention program. Mobile home communities of a multiethnic nature were rapidly erected and became a source of not inconsiderable tension and violence. The situation in Rapid City constituted a logical site to examine family recovery processes. Here was a suitable population of victims from the mildy stricken to those who had lost homes and family. Many had to relocate to new areas in unfamiliar surroundings. The only aspects of victim family life that were not altered to any degree were jobs and work.

Methodology

A random sample of victim households was drawn in the context of another study [1] (Mileti, 1974). This sample was utilized in the current research, with victim families interviewed twice over a two-year period. The final adjusted sample size was 125 families [2]. A control group sample of 70 was also drawn to improve the internal validity of the design [3]. The control group was comprised of nonvictim families randomly selected. Families were interviewed in June, 1973, and May, 1974, by trained interviewers familiar with sociological interviewing techniques. Each interview was field-checked by telephoning the respondent to confirm selected answers.

The interview schedules, constructed after site visits and a review of relevant disaster literature, obtained information on major aspects of family life, including housing, employment, education, "life styles," attitudes, and demographics. Preimpact measures on certain items such as housing characteristics and employment histories were gathered. The use of such recall and self-reported behavior items is a possible source of error in survey research (Cook and Sellitz, 1964; Dohrenwend, 1966; Hyman, 1954; Phillips, 1971), and is recognized as such here. However, many schedule items were of the sort that social desirability responses and response-set biases (Babbie, 1973), were not likely to occur. It is felt that this factor further minimizes threats to internal validity through error.

Indicators of Family Recovery

Eight composite indicators thought to be important in understanding family recovery were constructed, based on the face validity of the items. Each index was a composite of several items thought to be good indicators of a given concept. After the indices were constructed, all variables contained in them were factor analyzed (Rummel, 1970), to see if underlying statistical dimensions upheld the original formulations. Some additional items not included in the original indices were added to see if they clustered on a given dimension. In this way indices were refined by the addition or deletion of items.

TABLE I

Factor Analysis of Index Components for Family Recovery

Factor	Variable	Factor Loading
Degree of impact	Percent of flood damage to residence	0.556
	Percent of furnishings lost	0.495
	Dollar loss of furnishings	0.566
	Percent of personal possessions lost	0.467
	Percent of damage to automobiles	0.475
Disruption	Number of moves made after flood	0.953
	Presence of friends in new neighborhood	0.689
	Visitation with preflood friends	–0.414
	Change of residence since July, 1973	–0.944
Institutional embeddedness	Receipt of disaster aid	0.722
	Organizations that gave aid	0.835
	Aid eligibility information	0.921
	Organizations applied to for aid	0.649
	Amount of housing aid received	0.585
	Amount of aid for furnishings	0.958
	Amount of aid for personal possessions	0.560
Kin embeddedness	Receipt of help from relatives	0.418
	Amount received	0.566
	Frequency of visitation with kin	0.711
	Postflood change in visitation with kin	0.423
	Feel could get aid from relatives	0.512
	Who to go to if had family problems	0.648
Family recovery	Comparison of current living situation to preflood one	0.445
	Comparison of standard of living to preflood one	0.428
	Is life happier now compared to preflood happiness	0.491
	Explanation of change in happiness	0.528
Socioeconomic status	Chief wage earner's education	0.593
	Chief wage earner's income	0.517
	Chief wage earner's occupation	0.446

Initial factors were extracted using principal component analysis from the Statistical Package for the Social Sciences program (Nie et al., 1975). The factor matrix output from this was then rotated to simplify the factor structure. The orthogonal VARIMAX technique was used in the rotation (Nie et al., 1975: 485). The resulting factors paralleled the indices constructed prior to analysis to a satisfactory degree. Table I presents the name of the extracted factor, the items in that factor and their loadings. The minimum acceptable loading of a variable on a factor was set at 0.400 (16% of the variance explained).

Two additional indices to be used below were not factor analyzed due to the nature of their construction. A family life cycle indicator was derived directly from the interview schedule. Families were assigned scores on the basis of marital status, age of husband, age of wife, age of children (if any), presence of children in the home, and presence of older parents in home with children (extended family), (e.g. Hunter, 1975). A housing recovery index was developed through computation of changes in housing characteristics using pre- and postflood housing measures, e.g. number of rooms, number of bedrooms, whether home was permanent, changes in tenure, etc.

Discussion of the Measures

The measures of impact and disruption will be used as necessary determinants of the family response indicators. That is, the severity of impact and amount of disruption will be considered prime determinants both of how much and the sources of aid for recovery a victim family seeks (Moore et al., 1963; Quarantelli, 1960). Two exogenous indicators that also affect recovery of victim families are their socioeconomic status and their position in the family life cycle (Cavan, 1974). Families in latter stages of the life cycle will tend to be less able to recover from stress than will younger families with concomitantly less attachment to place and more resources (Friedsam, 1962).

The two primary modes of family recovery have been labeled kin embeddedness and institutional embeddedness after Adams (1975: 92). In the sense used here kin embeddedness conceptualizes the degree of family dependence and interaction with extended kin groups in the recovery process. Departing from Adams' usage, institutional embeddedness here entails the degree to which families utilize community agencies in the recovery process. Thus, families with a high degree of institutional embeddedness used multiple sources of extrafamilial aid to recover and reconstruct after the disaster.

Family recovery as a dependent variable has been divided into two components, housing recovery and family recovery. Housing recovery simply refers to the extent to which a family reestablishes equivalent or "better" housing when compared to their preflood residence. Family recovery conceptualizes a more perceptual dimension of readjustment. Items in this index assess a family's perceptions of life satisfaction when compared to their preflood levels. What is concerned here then is how a family defines its situation and how it comes to redefine its situation as recovery progresses.

These indicators have been utilized in a causal model of family recovery, and it is this model which will now be examined.

TABLE II

Zero Order Correlation Coefficients* Among All Indices

	1.	2.	3.	4.	5.	6.	7.	8.
1. Impact	...	0.040	0.083	0.403	0.760	–0.157	0.298	–0.036
2. SES	...	...	–0.120	–0.121	0.056	0.106	0.172	0.174
3. Life Cycle	...	...	...	0.027	0.042	0.188	–0.176	–0.305
4. Disruption	...	...	...	...	0.291	0.062	0.110	0.054
5. Institutional Embeddedness	...	...	...	...	...	0.112	0.305	–0.011
6. Kin Embeddedness	...	...	...	...	...	...	–0.173	0.235
7. Housing Recovery	...	...	...	...	...	...	...	–0.031

*Coefficients greater than 0.135 $p<0.05$; 8 = Family Recovery

TABLE III

Standardized Regression Coefficients for Path Model

Dependent Variable	Independent Variable					
	X_1	X_2	X_3	X_4	X_5	X_6
	Standardized Regression Coefficients					
X_8 Family Recovery	–0.036	0.174*	–0.301	0.054	–0.011	0.234*
X_7 Housing Recovery	0.293*	0.172*	–0.174*	0.103	0.233*	–0.162*
X_6 Kin Embeddedness	–0.148*	0.102	0.180*	0.062	0.101	....
X_5 Institutional Embeddedness	0.760*	0.056	0.042	0.241*	....	....
X_4 Disruption	0.403*	–0.101	0.027	....	....	....

*$p<0.05$ and at least 2 times standard error.

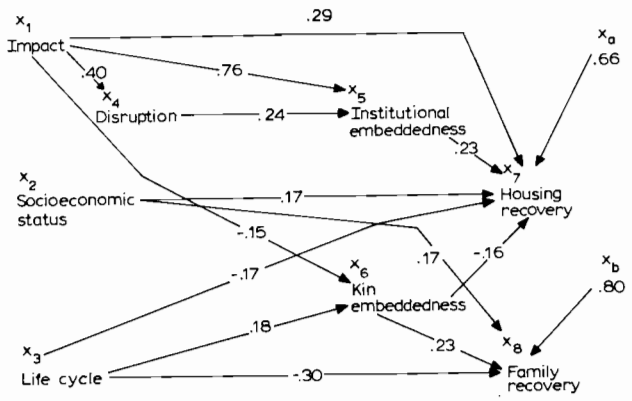
Family Recovery: A Causal Model [4]

In developing a recursive causal model of family recovery, a zero order correlation matrix of the major variables was run (Table II). The size and direction of the coefficients leant support to an implicit model of the indices. Based on the correlation matrix a preliminary causal model was constructed. Paths were drawn between variables that had relatively high covariate associations.

Regression analysis, using a subroutine of the Statistical Package for the Social Sciences (Nie et al., 1975), was performed to derive standardized regression coefficients (beta weights) for the specified relationships in the model. Table III presents the multiple regression analysis and Fig. 1 illustrates the model with all statistically significant direct effects noted.

Discussion

Examining total causal effects (Table IV) of the independent variables on the recovery measures, it can be seen that impact, position in the life cycle, and institutional embeddedness are the most important explanatory factors in regard to housing recovery. Life cycle, kin embeddedness and, to a lesser degree, socioeconomic status, have the greatest total causal effect on the family recovery index.



NOTE: x_a, x_b = residual effects

Fig. 1. Path diagram of family recovery showing statistically significant direct effects

TABLE IV

Decomposition of Effects of Independent Variables Specified in Path Model

Causal Variable	Total Causal Effect	Direct Causal Effects on X_7, Housing Recovery	Indirect Causal Effects on X_7, Housing Recovery
X_1 Impact	0.446	0.293	0.153
X_2 SES	0.172	0.172	–
X_3 Life cycle	–0.200	–0.174	–0.026
X_4 Disruption	0.055	–	0.055
X_5 Institutional Embeddedness	0.234	–	–
X_6 Kin Embeddedness	–0.162	–0.162	–

Causal Variable	Total Causal Effect	Direct Causal Effects on X_8, Family Recovery	Indirect Causal Effects on X_8, Family Recovery
X_1 Impact	–0.045	–	–0.045
X_2 SES	0.174	0.174	–
X_3 Life style	–0.266	–0.301	0.041
X_6 Kin Embeddedness	0.234	0.234	–

The indirect effect of impact on housing recovery is about one-half the direct effect (Table IV). This points to its importance both directly and through the mediating effects of other endogenous variables. It can also be seen that the severity of impact determines the degree a family becomes reliant on extra-familial aid sources (e.g. Moore et al., 1963). Although the coefficients are not large in absolute terms, at least part of the effect of disaster impacting on housing recovery is mediated by both disruption and institutional embeddedness factors.

The direct effect of socioeconomic status on housing recovery is moderate. Socioeconomic status affects family recovery positively. High SES families, in the current data, were

more likely to readjust successfully after the disaster than were lower income families. A family's SES does not have any indirect effects on either recovery measure.

A family's position in the life cycle has multiple effects on both dependent variables. The indirect effect of life cycle (Table IV), mediated by kin embeddedness on housing recovery is considerably smaller than its direct effect. The negative values are consistent with a logical interpretation. Older families are less likely to reestablish homes than are younger families. The direct effect of life cycle is also negative. Thus, older families are less likely to readjust, in a perceptual sense, than are younger families. The effects of life cycle, mediated by kin embeddedness are found to be positively associated. That is, families who utilized kin aid and support are more likely to recover (as it is defined here), than those who do not. While kin may not be able to give families the aid needed to reestablish a home, they can give them much needed comfort and emotional support. This reflects the importance of kinship linkages in the recovery process noted elsewhere (e.g. Drabek and Key, 1975).

CONCLUSIONS

The long-term effects of disaster on families have only recently come under the scrutiny of sociologists. A causal model has been developed here to explore relationships between major factors hypothesized to affect long-term family recovery. Family recovery has been conceptualized to have two dimensions: (1) a housing recovery dimension, and (2) a perceptual, life satisfaction dimension.

By way of summary, findings from this analysis may be stated in general propositional form.

1 The more severe the impact of the disaster on a family's resources and the more residential dislocation it experiences, the more likely will that family seek recovery aid from community agencies if it is available.

2 The more a family utilizes institutional aid sources, the more likely will that family recover or reestablish housing equivalent to that lost in the disaster.

3 The higher the socioeconomic status of a victim family, the more likely will that family reestablish housing equivalent to that lost in the disaster.

4 The later a victim family is in the life cycle, the less likely will that family reestablish housing equivalent to that lost in the disaster.

5 The more severe the impact of a disaster on a family, the less likely will that family rely solely on extended kin for recovery aid.

6 The later a victim family is in the life cycle, the less likely will it utilize kin-based aid for recovery.

7 Families that rely solely on aid from extended kin groups are less likely to reestablish housing equivalent to that lost in the disaster.

8 The higher a victim family's socioeconomic status, the more likely will that family recover in a perceptual and emotional sense from the disaster.

9 The later a victim family is in the life cycle, the less likely will it be able to recover in a perceptual and emotional sense from the disaster.

10 The more a victim family utilizes aid from extended kin, the more likely will that family recover from the disaster in a perceptual and emotional sense.

What this analysis has attempted to do is to present a systematic examination of long-term family recovery from disasters using rigorous statistical techniques. There is a need for further research in this area in order to elaborate the causal model and refine indicators contained in it.

NOTES

1 Mileti drew the sample by first establishing the parameters of the flood waters and then drawing a random sample of residents based on utilities records. Three sampling areas were established; a zone of heavy damage to residences; a zone of light damage to residences; a zone of no damage to residences. The damage zones were combined and those sampled from these zones constitute the victim sample in the current study.

2 The original sample size (Mileti, 1974) was 189. The sample size at the time of the first wave of the current interviewing was 147, due in large part to families moving out of town. The sample size at the time of the second wave of interviewing (May, 1974) was 125 families. The wave I sample is adjusted to this size to facilitate statistical analysis.

3 While the control group (sampled from the zone of no damage) is not used directly in the current research, those data have been used to compare responses of victims versus nonvictims to the event to better ascertain if changes in victims are the result of the disaster or confounding influences such as "history".

4 The statistical techniques used in the building of a causal model come under the rubric of multiple regression analysis. Briefly, multiple regression analysis is a method by which the effects of several independent variables are assessed for a single dependent variable. Path analysis is a specific form of multiple regression analysis in which the researcher imposes a set of causal assumptions. See Loether and McTavish (1975) for a good introduction to both topics and the requirements for using them.

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PERSISTENT EFFECTS OF DISASTERS ON DAILY ACTIVITIES: A CROSS-CULTURAL COMPARISON*

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INTRODUCTION

Disasters may be seen as rather abrupt and usually unanticipated events producing extensive physical disruption and a need for relocation of families and their activities. Large-scale disasters have inescapable effects on the quality of life of families in stricken communities.

Disaster research has generally focused on the immediate aftermath of disasters, labeled the emergency period (see Mileti et al., 1975). Such studies have looked at the types and extent of losses, the ways individuals and families manage during the aftermath with respect to the rescue of others, salvaging of possessions, finding food and temporary shelter, and in general reestablishing a familiar "place" to serve as a base from which to initiate long-term recovery plans and activities.

The process of reestablishing the daily routine over the long run has heretofore been largely ignored in disaster research. However, literature in other fields would suggest it as an area for concern. For example, attempts to develop indicators of quality of life assume that physical setting, material possessions, recreation facilities, educational and social opportunities, and ease in spatial mobility are important to individuals (see Sheldon and Moore, 1968). Also, urban planning literature reflects concern for the physical and social settings of daily routines of families during the period of active urban renewal programs. The effects of large-scale relocations of families on the psychological and perceived well-being of their members were studied by Fried (1967). Certainly relocating physical structures has consequences for neighborhood social organization and function. Neighboring and visiting with nearby relatives constitute an important part of many families' daily routines (Bott, 1971; Wellman, 1973). Urban renewal has been shown to have a detrimental effect on social linkages and networks for families forced to relocate (Fried and Gleicher, 1961). The importance of use of local facilities to people's conceptions of their community has been noted (Foley, 1950; Hunter, 1975). Real and perceived changes in community structure and layout will affect how a family "feels" about its activities, the community, and perhaps about life in general.

Suttles (1972:22) refers to the "cognitive maps" residents have of their communities.

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These maps are mental images that persons have of their community based on their uses of it and their orientations toward it. Such maps are the underpinning for a person's perception of distances to places, routes taken to get to places, and of what exists in the neighborhood or community in the way of facilities, including his perceptions of where he will be welcome and where not.

Within the disaster research field one recent study of the long-term effects of a disaster reports on social relationships. Drabek and Key (1975) found that relationships with friends and relatives were changed among disaster victims in the aftermath of a tornado in Topeka, Kansas. However, they found that change could be positive or negative; in brief, strong bonds got stronger, and weak or weakening bonds became even more unstable or broke altogether.

In disaster situations long-term recovery includes such things as reestablishing a permanent residence and permanent employment, and renewing and stabilizing daily activities such as shopping, attending school, visiting with friends and relatives, and other related social and leisure activity patterns. Linkages with various community organizations such as businesses, voluntary associations, churches and recreational groups may also have to be reestablished after the period of concentration on immediate emergency and recovery activities.

Leisure and social activities will be disrupted due to the relocation of families and to the destruction of the physical facilities for the various activities. Other activities may be disrupted not as a direct consequence of the disaster, but rather due to changes in the physical setting during and after reconstruction. Reconstructed communities seldom are identical to their predisaster form. Spatial relocation of activities not only affects those directly impacted by the disaster, but others in the community as well. The disruption created by disasters may be long term. The complexities of social life may be disturbed for periods extending beyond the actual physical reconstruction of the community.

MANAGUA AND RAPID CITY

Two disasters which occurred in 1972 will be used to describe and document further the long-term consequences of disasters on the daily activities of disaster victims. The dimension of cross-cultural comparison is permitted by having data from a major earthquake in the capital city of Nicaragua in Central America, as well as from the disastrous flash flood which occurred in Rapid City, South Dakota.

The earthquake of December 23, 1972, in Managua, Nicaragua, damaged or destroyed the man-made environment in over three-fourths of the city. Some 400 blocks in what was the downtown part of the city were for the most part badly damaged. Virtually all activity was prohibited in this area of the city, only two governmental buildings remaining in usable condition. Thus the central business district and numerous blocks of dense residential use were completely destroyed. Damage was heavy though less total in other parts of the city. Thousands of families evacuated the city, but there was definite evidence that most returned to Managua within the first year. Many families were able to take up residence with relatives in less damaged houses, some found vacated housing to rent, repaired their own dwelling, or perhaps erected a new dwelling of crude materials and without legal permit. Within four months following the disaster some 9,000 units of "temporary housing," provided by international aid and the Nicaraguan government, were ready for inhabitance. A minimal initial fee and monthly charge were asked. Yet only about 2,000 families moved into these during the early months of their availability and many soon moved out due to the unsuitability of the area in several respects. Others lived there and suffered the consequences of being located far from the center

of activity, having to contend with poor transportation facilities, and the lack of amenities such as adequate water, drainage, and sanitary facilities. There was little else in the way of large-scale government sponsored rehabilitation and recovery programs for families outside of long-term food distribution to the more destitute, and an attempt to institute a "food for work" program.

On June 9, 1972, a flash flood of massive proportions swept through Rapid City, South Dakota. In an area of several blocks on each side of Rapid Creek there was extensive structural damage; 238 persons lost their lives. This high death toll was an outstanding feature of this disaster, compared to other U.S. disasters. Nearly 1,200 residences were completely destroyed with more than that number receiving considerable damage. Temporary housing had to be found for more than 1,200 displaced families. Other victim families were able to return to their former houses although many of the structures required much cleaning and repair work. Later many had to move again, as the floodway was condemned for residential use, and persons had to relocate out of the flood plain.

Given the preflood housing shortage in Rapid City and the loss of many residential units, the Department of Housing and Urban Development (HUD) was able to place immediately only about one third of those families needing temporary housing. To house the remaining families, HUD purchased mobile homes to serve as temporary housing until the private sector could build suitable new residences. By August, 1972, HUD had placed over 2,100 persons in 445 mobile homes. While the trailers were ostensibly free for one year, it was necessary for the City of Rapid City to assess a $ 45 site fee (later reduced). The hastily constructed trailer courts in which many of the HUD trailers were placed were the scenes of considerable dissatisfaction and interethnic tension.

The Small Business Administration (SBA) was actively involved in Rapid City in giving out low-interest loans with large forgiveness clauses to facilitate the repair of flood damaged houses and businesses. By October, 1972, a large-scale Urban Renewal project was underway to clear a floodway. This program made cash grants and related benefits available to victims who had to relocate.

METHODOLOGY

Studies made at each of these sites during the early postdisaster phase (Kates et al., 1973; Mileti, 1974) afforded a base from which to continue research into long-term consequences. The project to study the issues during the reconstruction phase of a community involved a multidisciplinary, cross-cultural design, and included the study of two historical disasters as well as the two recent ones discussed here. This paper reports findings from the sociological portion of the research and only on the part of the study made of the two recent disasters.

A longitudinal research design was employed to assess recovery of families directly affected by the disaster. The families, selected with systematic random sampling procedures, were interviewed at two points in time. In Managua, the number interviewed at both points in time was 376 and in Rapid City 125. During these interviews, respondents were asked questions with the intent of establishing the rate and degree of recovery in the areas of housing, employment and family "life style." The latter area is the focus of this paper. A baseline was established by asking the respondents during the first interview to describe in retrospect their family's situation at the time of the disaster. For the purposes of reporting the findings in this paper, the first interview in each city will be referred to as Time 1, and the second as Time 2. For Managua, the Time 1 interviewing began the last week in July and extended through August 1973, thus in general occurred seven to eight months after the di-

saster. Time 2 interviews were conducted in May 1974, or some seventeen months after the disaster. In Rapid City, the interviews were in June 1973 and June 1974. Time 1 and Time 2 interviews coming one year and two years after the disaster respectively. Typical research constraints created by the contract periods of the grant, the unavoidable situation of the Rapid City disaster occurring six months earlier than the Managua disaster, and the belated recognition of the difficulties attendant to interviewing during the rainy season in Managua led to the somewhat different relative time periods for interviewing in the two sites.

In retrospect, it becomes clear that time may not be the most critical variable anyway, in determining whether or not families were ostensibly at the same point in their recovery process in the two cities. The types of issues and the speed with which certain problems are resolved in the physical and economic reconstruction of a city may make this different in each site. Further case studies such as these would help to clarify that.

Besides the survey methodology, a second method was used in an attempt to get a better understanding of the problems of family recovery as seen by the families themselves. A purposive selection process, intended to get a range of socioeconomic or occupational types and of survey interview responses to questions about satisfaction and recovery levels, was used to identify a few families out of the survey samples for further in-depth interviews. In Managua twenty such interviews were conducted and in Rapid City, five. These interviews, done several weeks after the completion of the survey, were tape recorded and transcribed. They provided further insights into the types of things which created constraints for families in actually recovering from the disaster, as they related in greater detail the losses the disaster created for them personally and the physical differences it made in the community at large, from their view.

Constraints on Recovery

An analysis of recovery in areas of housing and perceived recovery in Rapid City can be found in the Bolin article, "Family Recovery from Natural Disaster: A Preliminary Model" (this issue). It focuses on the family system level while demonstrating that the recovery of victim families is effected not only through the efforts of individual families and their kin groups, but also through community level reconstruction activities.

Recovery in the area of employment was not a serious problem in the Rapid City case, primarily due to the more limited impact of the disaster agent on the business sector. The problem of disaster-induced unemployment was pervasive in the aftermath of the Managua earthquake. Findings on this aspect of recovery in Managua are described in *Reconstruction Following Disaster* (Haas, et al., forthcoming).

As indicated by the literature on other subjects, such as quality of life indicators, urban renewal effects, and basic sociological observations concerning social linkages, as well as Drabek's and Key's longitudinal study of Topeka, Kansas (1975), another area in which recovery must be made is that of the more mundane aspects of daily living, such as shopping, visiting, and other uses of leisure time. It was felt likely that evidence would be found in these two disaster sites that families' attitudinal orientations to these activities and the physical settings in which they occur were disrupted, due to the loss of relatives and friends, the relocation to new areas, and the interruption or relocation of local services and facilities.

The case studies of the two cities indicate that the disruption of routine activities, including use of local facilities, neighboring, kin visitation, and leisure, was pervasive following the 1972 disaster at each site. Further, for some families alterations in daily life styles persisted, or were perceived to still exist, for periods of more than a year following impact.

It can be seen that life style recovery was affected by social, economic, and locational or structural constraints experienced in the aftermath. Also, persons experienced changed perceptions of places or features of their life. To reestablish routine activity patterns, or to institute new patterns considered to be as desirable as were the predisaster set, families will generally be constrained by some or all of these factors. The "normalization" of a victim family's social, economic, or locational situation is linked to reconstruction activities at the level of the community.

In illustration, a family may have habitually gone to the movies once a week prior to the disaster. During the immediate aftermath they are likely not to think about it as they are preoccupied with finding or preparing temporary living quarters and reestablishing certain social linkages. Then for a while they may not consider it because they don't really have the money to spend on anything other than replacement of lost possessions. Eventually they may have the money to go, the means of getting there, but cannot attend because the theater has not been rebuilt. In turn, business interests intending to rebuild the theater may be waiting for community planners to establish a master plan of reconstruction. The interdependencies between the various levels of community organization (e.g. families, business organizations, governmental agencies, etc.) can be seen.

To further illustrate various kinds of constraints, and the kinds of interdependencies underlying them, one can consider the example of an elderly person who prior to the disaster was extensively involved in neighboring activities in his or her neighborhood. Due to being relocated after the disaster, the elderly person may desire to reestablish ties to neighbors as an activity, but may not "feel like" associating with persons in the new neighborhood. People who are familiar with others in their neighborhood may not readily accept establishing relations with persons who are unfamiliar to them in terms of age, ethnicity, or social class characteristics. Such a situation is particularly critical when victim families must seek governmentally provided housing on a first-come-first-served basis. In such instances temporary neighborhoods emerge in which people of disparate backgrounds are placed together but are isolated in terms of social contact. These situations are exacerbated when temporary housing sites are not linked to the rest of the urban area by mass transit, enabling persons to easily visit former neighbors or friends who live elsewhere.

While the reestablishment of permanent neighborhoods may remove some of the constraints against reestablishing new relationships, disasters nevertheless have persistent effects on social networks. Furthermore, because of deaths associated with disasters some relationships simply cannot be renewed, whatever opportunities are provided for relocating in former neighborhoods, or in proximity to former neighbors and friends.

FINDINGS

That two such different cities and different disasters are being compared is mainly fortuitous. The very nature of disaster events can preclude creating tight research designs of matched communities and timing of events. Nonetheless the cross-cultural comparison of the two has proven instructive. Even though details may be quite different due to cultural differences and the differing levels of economic development, the general underlying feature of the persistence beyond the emergency period of the disruption of routines and social networks is obvious in both communities. To some extent there were differences in the constraints underlying the persistence of feeling that things were not back to normal. These may be due to cultural differences, to the nature of the disaster, or to the manner in which the physical reconstruction of the city progressed.

Findings about life style changes will be presented here by describing findings on a particular area of daily activities first for Managua, and then for Rapid City, and then moving on to another area of questioning, repeating the format.

Visiting

Time 1 interviews with Managua respondents indicated some alteration of relationships, especially with relatives, but at that time many were still sharing housing with relatives or had shared in previous months. By Time 2, most had been able to establish a private dwelling, and former patterns of visiting would have had a chance to normalize if it were possible. At that time family respondents were asked if they visited with friends and relatives more, less, or with about the same frequency as before the disaster. About 60% reported they engaged in about the same amount of visiting as before. But 28% indicated they visited less with their relatives than they used to, and 31% reported less frequent visiting with friends than before the disaster.

The in-depth interviews done with some of these families indicated that to a great extent decrease in visiting had to do with the dispersion of persons throughout the city. The city was viewed as being more difficult to get around in than prior to the disaster. Furthermore, the cost of public transportation had risen considerably, and many persons found themselves in poorer economic conditions than they had sustained prior to the disaster, due to the disruption of employment and the rising cost of living. Thus it was a combination of a physical and economic constraint which affected visiting. In some instances relatives were reported still to be living out of the city and thus more difficult to visit. With respect to friends it was not uncommon to hear families reporting that they had not been able even to find many of their former friends and neighbors. People had dispersed rapidly and widely in the immediate aftermath and had not had time or means to advise others of their destination. In Managua an estimated one percent of the population was actually killed in the disaster so some families experienced disruption in their social activities due to the loss of relatives or friends. It can be suggested that the total loss of close relatives or friends may take on an importance out of proportion to the actual numbers of friends or relatives now dead and not included in one's social network. Further study is warranted into this aspect of recovery of social networks after disasters.

Rapid City victim families also displayed a decrease in frequency of visiting. At Time 1 in Rapid City, 41% of the victim families interviewed indicated they visited their predisaster neighbors less, while 9% said they visited their relatives less than before the impact.

Rapid City families, like Managua families, indicated that they were affected by the post-disaster situation of increased physical distances, or increased difficulties in mobility, which resulted from the dispersion of victim families relocated in temporary housing. While Rapid City is not large geographically and transportation is mainly in private automobiles, the elimination of many bridges made cross-town travel a more time consuming affair than prior to the disaster. Forty-two percent of the respondents maintained that two years after the disaster, Rapid City was less easy to "get around in" than before.

A second constraint to visiting in Rapid City had to do with the reduced amounts of free time available to victim families. At Time 1, 32% of the victim families interviewed said that they had less free time than before. Even at Time 2, 31% indicated that they had less free time than before the flood. Thus it appears that the lack of free time, coupled in some instances with longer travel times, resulted in a relatively long lasting reduction in visitation frequencies of victims with friends and neighbors. With respect to relatives, in Rapid City there was only a slight decline in visiting after

the disaster, and most victim families reported normal visiting frequencies with kin by Time 2. This would indicate the greater saliency of kin networks over friendship networks to victim families in the recovery stage.

It might be noted that the same thing should be true in Managua, if not more so, since kin interaction is typically carried on at a very high rate in Latin societies (Carlos and Sellers, 1972). That visiting with kin as well as with friends showed a long-term reduction in frequency may well reflect the serious disruptive aspect of the constraints put on mobility by postdisaster conditions in Managua. In a city with extensive use of mass transit, the postdisaster dispersion of the population coupled with extremely circuitous bus routes, increased fares, and inadequate service in general apparently created a major problem.

Leisure Activities

At Time 2 in Managua, 32% of the heads of household were reported to no longer engage in what had been their favorite leisure time activity prior to the disaster. The most frequent reason given for this was that they could not afford the activity since the disaster. For some, the statement of an economic constraint indicated lack of enough extra money to replace destroyed entertainment items like a television set or stereo; for many it meant the lack of extra money to spend on movie admission, or to eat and drink in the restaurants and clubs being reestablished in the city.

In the Managua Time 1 interview, 45% had reported they did not engage in their favorite leisure activity any longer. At that earlier stage the most frequent reason given for the change was that of a physical one – the disruption of many leisure activities was linked to the physical destruction of the city. It became apparent that once the physical places of entertainment were again provided, this kind of activity was still reduced. Respondents then came to see it as a matter of their own personal economic constraints. It may also be that in some instances there were more subtle reasons, such as unfamiliarity with the new places, or disinterest in going without former friends.

The major constraint indicated by Rapid City residents was different. As already indicated with respect to visiting habits, the reduction of discretionary time for other leisure pursuits in Rapid City was felt by the victims even two years after the disaster. While many respondents revealed a reduction in the amount of time available for leisure pursuits, when time was available most families (71%) continued to pursue their favorite preflood leisure activities. It should be remembered that of those in Rapid City indicating a reduction in the amount of time spent on leisure activities, 77% said it was due to the amount of time expended getting their homes cleaned up and repaired. In-depth interviews disclosed that some families were still cleaning the "residue" of the flood from their homes for up to two years after the disaster.

In Rapid City few commercial sites for leisure activities were destroyed; thus families were not constrained by the lack of physical facilities as they were in Managua. Also reliance on the automobile for leisure meant that victim families could continue to pursue outdoor leisure activities in the nearby Black Hills, away from Rapid City.

Shopping

In Managua, all but one of the traditional open air produce and dry goods market places were destroyed, as were most of the more modern supermarkets. So most families changed where they shopped, thereby losing the feeling of shopping in a familiar place. Those who had shopped in the central market place in the downtown area prior to the earthquake for the most part changed to shopping in the one remaining marketplace

in the eastern part of the city. Almost 40% of the respondents at both Time 1 and Time 2 reported that where they shopped at that time was further from where they lived than where they had shopped prior to the disaster.

Many new and modern shopping centers were built around the periphery of Managua, being ready for business by the end of the first year. For persons with cars and adequate income, these shopping centers may be an improvement over the congested downtown area of prequake days. However, they do not provide the range of goods, opportunity for comparative shopping for produce, and lower prices critical to those with meager resources. Most families continued to do the bulk of their shopping in the open marketplace. This created great inconvenience for the many who lived in the western part of town. Added to this was the extra expense of bus or taxi. With food prices having doubled and even tripled in the fifteen months following the disaster (without concomitant increases in salaries), paying busfare besides could mean not buying meat that week.

Respondents in the in-depth interviews in Managua indicated that having to spend two or three hours to get across town and back necessitated changes in houshold management and meal planning. For example, shopping trips were made less often (no small issue when one had no refrigerator), or it was necessary to orchestrate activities of others in the household so an adult or older child could be at home with the young children. Thus the constraint of there simply not being several physical locations from which to select a shopping place, added the secondary constraints to recovery in shopping patterns of more time needed to accomplish the task, more familial disruption and some added economic burden.

Unlike Managua, the commercial sector of Rapid City was not heavily impacted in the disaster. As with many North American cities, Rapid City is characterized by multiple supermarket-chain store centers. Only one of these was damaged in the flood and it reopened again after repairs. The net consequence of the distribution of shopping centers was that few victim families reported any change in their shopping patterns. Of those interviewed, 11% had changed grocery stores in the year after the flood. Those that changed did so because they had relocated to a new area of Rapid City and another shopping center was more convenient.

Thus it appears that even though having an automobile meant that families were not necessarily restricted to neighborhood facilities, and there were optional facilities throughout Rapid City, the families seemed to prefer convenience when it came to establishing shopping routines. It is difficult to make this comparison in Managua since those who preferred to shop in the open marketplace had few choices. It cannot be known if those families would have continued to shop in a familiar marketplace (a shopping situation much more personal than a modern supermarket) or would have changed to the one most convenient to their neighborhood.

Life Satisfaction

A feeling of being as satisfied with life as before the disaster was slow in coming to many victims of the Managua disaster. At Time 2, 57% of the Managua families still reported that they were less satisfied with life than they had been before, while 11% reported that they were actually more satisfied than they had been prior to the disaster. As would be expected, significantly and positively associated with regaining a sense of satisfaction equal to one's prequake days were variables indicating the extent of recovery or improvement in family income. Economic constraints affected all areas of life.

In an attempt to get at a somewhat less subjective dimension than satisfaction, Managua respondents were also asked about recovery of their standard of living. At Time 2,

65% said their standard of living was still worse than it had been prior to the disaster. Almost 40% of those blamed their condition entirely on earthquake losses, while another 27% attributed it to a combination of their losses in the earthquake and the high rate at which the cost of living had increased since the earthquake. Twelve percent blamed it only on the rising cost of living.

The item on recovery of standard of living was a fixed-choice one, thus not allowing for elaboration of what "earthquake losses" meant to respondents. Certainly material losses would be the most likely type of loss they thought of. The most salient point made in the majority of the in-depth interviews was the difficulties created by economic conditions and the consequent impossibility of recovering one's former lifestyle. It is possible that many respondents were still affected by more subtle feelings of loss associated with changes in their physical environment and in the network of relationships. Many respondents in the in-depth interviews commented on the difficulty of getting about the city, on the loss of their homes and friends, and in general displayed distress at the changed nature of their daily lives. For some this was stated in terms of changes brought about by their own physical relocation, for others by changes in a once familiar neighborhood now partially in ruins. They indicated secondary consequences of the economic setback associated with the disaster. For example, some reported avoiding friends because they could not reciprocate appropriately. A few implied they were simply too depressed and tired to care. It is not possible to know if such feelings indicate trauma related to having experienced the disaster impact, or if perhaps such fatigue and depression grow out of contending daily with a largely unfamiliar and frustrating set of physical surroundings and an altered economic situation and social setting.

In Rapid City, in terms of self-reported happiness, at Time 1, 22% of the victims reported their lives to be less happy than before, while 15% reported theirs to be more happy. By Time 2, there were increases both in the number reporting their lives more happy and in those reporting their lives less happy; the percent reporting their lives more happy changed from 15% at Time 1 to 22% at Time 2, the percent reporting their lives less happy increased from 22% to 28%. Those indicating a decrease in happiness attributed it for the most part to monetary difficulties and unpleasant memories of the flood.

One possible interpretation of this rise in the percentage reporting decreased happiness is that it is a consequence of the family having completed the resettlement process. That is, while they were going about the instrumental activities of finding and moving into a permanent residence, they were still considering their situation to be temporary and in flux. However once that was accomplished and their situation could again be considered a permanent and stabilized one, they had more time to reflect on their personal experiences and hence begin to feel more acutely some of the losses they had incurred, both physical and social. Another interpretation would be that over time they became disgruntled at the way reconstruction was being handled in the community and did not consider the situation in general to be in the process of "normalizing."

As in Managua, Rapid City families were asked about their standard of living since the disaster and how it compared to their pre-disaster standard. Only 17% of the Rapid City families considered theirs to still be worse at Time 2, compared to 65% in Managua at Time 2. The constraints to recovery in standard of living seemed similar, for Rapid City families indicated that the decline in their standard of living was due to a combination of flood losses and the increased cost of living; this even in a city where many persons received grants and loans to aid in the recovery of housing and possessions.

CONCLUSIONS

In the foregoing we have attempted to document the persistent effects of disaster on visiting, leisure time use, and shopping in two very different disaster stricken cities. While housing may be reestablished, jobs regained and standards of living normalized, the severed friendship networks, the lost familiarity of settings, and the need to reestablish routines affect families. In summary we have considered the effects of disasters on family recovery in terms of the various constraints suggested by findings and in-depth interviews. Constraints here refer to the perceived or real limitations imposed on victims by the consequences of the disaster and the social response to it. As suggested earlier, there appear to be five types of constraints which affect victim families. These are physical changes in the setting, normative demands on resources and behavior, economic demands, temporal demands, and subjective feelings about how things are going.

Physical constraints involve what limitations may be imposed on victim families by the physical destruction of local facilities. Family routines are disrupted due to the loss of local facilities (e.g. theaters, banks, stores, restaurants, schools), by the disruption of access routes, the disruption of urban mass transit, and by destruction of the family's house or even entire neighborhood. The latter is particularly constraining in cultures or subcultures where the home, front stoop, or patio is the general focus of social interaction.

Families may be limited in reestablishing daily routines due to normative or "social" constraints. For example, general normative obligations to kin may result in families spending time and resources on these relationships, thereby slowing down their own recovery process. In Managua it was apparently normative to house, or at least share even meager resources with relatives in the immediate aftermath (Kates et al., 1973). It is normative also that energy be spent to care for family members disabled by the disaster, and necessary to family stability that the internal family network be repaired when the role structure has been disrupted by disablement or death of a family member.

Besides family network norms, there are linkages with other networks that can create constraints on the recovery process. For example, rather than break perceived norms by participating in the social network without meeting certain unspoken requirements (appropriate clothes, nice enough house, reciprocity in entertaining), families may feel compelled to retreat. They may no longer invite people to their homes, or may no longer engage in other activities which were formerly opportunities for socializing with friends or business or professional associates. It may take some time to reestablish a social life which is compatible with their new situation and which is as satisfying to those involved as the former one.

Economic constraints are a frequent concomitant of disasters, particularly when there is little in the way of community-based aid forthcoming directly to families, as was the case in Managua. Families may lack discretionary funds for commercial leisure pursuits following disaster. They may have to reduce the standard of housing they were used to, or other types of consumer buying. Financial difficulties may result from such things as underemployment, unemployment and the resultant decrease in income, inflation, or to disaster related expenses such as medical care or house rental expense. Paying off a mortgage or credit payments on a house or other possessions that no longer exist can be an unbearable financial burden, and the likelihood of replacing such things under these circumstances is very slim.

Another disruptive consequence of disaster is that the changes in routines take up time. We have labeled these temporal constraints. There are several sources for increased demands on time including increased in-home cleaning

and rebuilding time, search time for new housing or employment, and increased travel time due to spatial relocation and dispersion. Without time for leisure, social activities and the like families cannot reestablish those activities.

The fifth type of constraint identified overlaps somewhat with the others enumerated. These are the subjective constraints, by which is meant how a family defines its current situation and how it is constrained by that definition of the situation. Whatever the objective conditions are with respect to amount of time for formerly routine activities, or the extent to which spatial dispersion creates a barrier to mobility, or even to the amount of money actually available to be spent for other than necessities, families may perceive that the situation is in some way affecting their lives and keeping them from being as satisfied as they were prior to the disaster. Families which are forcibly relocated by a disaster impact or the related policy for relocating persons away from the hazardous area may not resume routine leisure activities because they are in an unfamiliar part of the city. Families which find themselves in an unfamiliar neighborhood may not "feel" comfortable using local facilities, but voice the complaint that there are no adequate local facilities when in fact there are. It may be that there is not necessarily a one-to-one correspondence between the objective situation in the community and how a victim family perceives the situation.

RESEARCH AND POLICY IMPLICATIONS

The central concern here, from the sociological perspective, would be the determination of which of these constraints are related to the social structure in which the family is embedded, and thus are manipulable from the structural level. Relief and rehabilitation efforts in the immediate aftermath of a disaster play an important role in getting a setting established in which families can operate to routinize their lives again. When families are certain of where they will sleep that night and certain that they will have a meal, they turn to other considerations. One set of certainties builds on another. Routines are established and eventually a family feels things have normalized. This happens in conjunction with things going on at the community level such as physical structures being replaced, and functions being restored. During the rehabilitation phase community leaders may take steps which would be costly to reverse in terms of locational decisions and physical structures. Priorities for long-term reconstruction activities may have been established initially with short-term considerations in mind. Other decisions with respect to reconstruction still remain to be made at the community level, and decision makers do this based on the available resources and their perception of the needs of the community then and in the future. Further research into the interaction of these perceptions and the types of resources and needs actually in existence would be useful for sorting out the extent to which rehabilitation and reconstruction policies alleviate social effects of the disaster and the extent to which they prolong them.

As can be seen from some of the differences between Rapid City and Managua (even beyond cultural differences) the types of problems following a disaster will be somewhat site-specific. The nature of the disaster agent, the extensiveness of the damage, and the amount and type of human and financial resources available for planning and reconstruction affected policy decisions. In Rapid City it was relatively clear which section of town should be cleared for a floodway. In Managua, a decision on which areas to redevelop was more difficult because the entire area is hazardous. Formulation of policies concerning the relocation of facilities (such as the marketplaces), residential areas and where to allow repair and building were slow in coming and caused a great deal of uncertainty for affected individuals.

In both cities it appears that more definite attempts to provide better transportation, even if temporarily subsidized, would have alleviated one of the negative consequences of the relocation of families. In Rapid City no mass transit existed even though some victim families were relocated to the periphery of town. In Managua, the use of buses and taxis is well institutionalized, but no adequate measures were taken to reorganize and regulate the transportation companies in order to compensate for the now decentralized city.

In Managua there were definite indications that early attempts to replace places of entertainment would have given victims some sources of diversion, especially if prices were regulated. This in turn might have helped the morale of many who looked at the leveled downtown area with a sense of despair. Even the early redevelopment of parks would have given families a setting for interaction and the possibility of meeting with friends.

In Rapid City, vast federal resources and clear rules and procedures for their distribution contributed strongly to recovery in that many families received substantial help in recovering losses in material goods, in financing new homes and the like. But still some had a sense of financial difficulty. In Managua, recovery aid from government sources did not seem to be a possibility. As is the norm there, kin helped each other, and consequently none could get ahead of a difficult economic situation.

In both sites, the public provision of temporary housing offered low-rent shelter in the early months. However, in both cities the solution provided also created further disruption to social networks and in the daily activities of persons actually living in these settlements. In some ways these programs retarded the reintegration of families into established neighborhoods.

In conclusion, it is obvious that some social consequences of disasters simply cannot be avoided. The very word disaster connotes a grave disruption of all aspects of the lives of those directly involved and of the lives of many others. But sometimes it appears that too much concern is given to the physical reconstruction of cities while low priority and little attention are given to "small" things that might be done to hasten the social restructuring of human activities. Further research could determine more specifically which types of recovery aid given directly to families and which types of physical reconstruction can have the most multiplier effects for the social structure and family recovery.

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ORGANIZATIONAL-ENVIRONMENTAL PROCESSES IN RESPONSE TO THREAT*

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INTRODUCTION

This paper develops a conceptual scheme for the description and analysis of the organizational-environmental processes that occur as a result of massive and relatively quick environmental change. The scheme consists of four dependent variables representing general response processes which are ranked on a continuum of increasing organization-environment interaction. A number of explanatory or independent variables are then introduced to complete a theory which attempts to explain why some organizations respond more actively than others when faced with a massive and sudden environmental change and what types of change or other response behavior will be typical of various types of organizational units.

The theory was originally devised, and will be used here, for the analysis of one specific environmental change – the introduction of a scientifically credible earthquake prediction for an urbanized area. Since such a prediction is likely to be released several months or even years before the earthquake is expected to occur (the possible lead time increases as the magnitude of the predicted quake increases) such a prediction may have severe social, economic and political implications above and beyond the threat of the earthquake itself. (For instance, population growth in the prediction area is likely to decrease or even reverse, business activity will probably slow substantially, credit will become difficult or, in some cases, impossible to obtain, etc.) These effects are likely to compound one another enough to create a social, economic, and political emergency even before the earthquake occurs. At the same time, organizations will be faced with the decisions involved in preparing themselves for the predicted – but still future – physical mass emergency situation (the earthquake itself).

The theory presented here attempts to explain why some organizations faced with this type of emergency situation will essentially ignore it and go on as if nothing had occurred, while other organizations will take major steps to adapt to the new environmental situation (such as leaving the area completely, changing a majority of their work activities, forming new coalitions with other organizations, trying to change public opinion, legislation, etc.).

*This paper is one of several papers written using the ideas and results of a team research project on the Socioeconomic and Political Consequences of Earthquake Prediction carried out by the Research Program on Technology, Environment and Man, Institute of Behavioral Science, University of Colorado. Team members include Professors J. Eugene Haas and Dennis Mileti (co-principal investigators) with Janice Hutton, John Sorensen, Craig Piernot, Julia Mewes, Lynn Parsons, and Heidi Burgess assisting in the research effort.

The same framework can presumably also be applied to study the effects of several other types of environmental change, for instance, actual physical disaster (earthquake, hurricane, flood, etc.) or social "disaster" (major depression, riot, war, etc.). While there are important analytic differences between each of these collective stress situations (see Barton, 1969; Mileti et al., 1975) there are also interesting parallels which are highlighted by this framework. The theory further appears to be useful for the analysis of organization-environmental interaction in a relatively stable or slowly changing environment, the sort of study which is much more common in the organizational literature to date (e.g. Thompson and McEwen, 1958; Segal, 1974; Levine and White, 1961). Although the focus of most of the related literature is different from that to be used here, a brief review of some previous works will be helpful [1].

James D. Thompson and William J. McEwen were among the earliest theorists to emphasize the environmental impact on organizational behavior (Thompson and McEwen, 1958). They argue that the process of goal setting is essentially the process of defining the relationship between an organization and its environment, and thus goal setting is an interaction process between organizations and environmental factors. They also propose that the character of this interaction process for any particular organization is determined in part by that organization's position on a continuum of organizational power in environmental relations. This continuum ranges from one extreme at which an organization's behavior is entirely controlled by environmental factors to the opposite extreme where the organization controls portions of its environment to meet its needs. Clearly almost all organizations fall somewhere in the undefined middle ground; the definition of this middle ground will be further explored later.

The next important theoretical development in organization theory was the application of general systems theory to organizational studies (Emery and Trist, 1965; Thompson, 1967; Lawrence and Lorsch, 1967; Katz and Kahn, 1966). Among the important ideas of this metatheory are (1) that organizations are open systems which are constantly in interaction with their environments which are also open systems, and (2) as such open systems, organizations have feedback processes which allow for organizational adaptation to environmental change.

This perspective opened up a whole new area of investigation which primarily focused on stable or evolutionary interorganizational and environmental-organizational relations, for instance, organizational adaptation to the evolutionary increase in environmental complexity and rate of change ("turbulence," as coined by Emery and Trist, 1965). Adaptive mechanisms which have been suggested for this situation include the formation of increasing numbers of interorganizational links (Emery and Trist, 1965), active interorganizational communication (Terreberry, 1971), active search for and implementation of advantageous organization-environment relations (Terreberry, 1971), environmental monitoring (Mileti and Gillespie, 1976) and environmental forecasting (Thompson, 1967).

A few other theorists have considered the problem of organizational adaptation to rapid, short-term environmental change. Among the theorists in this area are Haas and Drabek (1973) who developed an entire theoretical perspective for the study of organizations based on the concepts of organizational stress and strain (which are highly related to rapid environmental change) and Mileti and Gillespie (1976) who developed a formalized, integrative theory of organization-environment relations which they apply to both "evolutionary" (long-term, relatively slow) and "mutational" (short-term and rapid) environmental change.

The theoretical scheme that follows is another integrative attempt, which draws ideas

from all of the above sources while applying them to a more specific problem than those dealt with above. This problem is, of course, the determination of the level of activism (or organization-environmental power as suggested by Thompson and McEwen) which is elicited by a mass emergency situation.

ORGANIZATIONAL ADAPTATION PROCESSES: A CONCEPTUAL SCHEME

Although organizations are constantly making minor adjustments in their behavior patterns to adapt to similarly minor changes in their environment, the adaptation processes become much more evident when they are made in response to a massive and relatively quick environmental change. When such a change occurs four levels of response become apparent.

The first, and least active response is environmental monitoring – the process of accumulating knowledge regarding the specific nature and probable effects of the environmental change. Strictly speaking, this monitoring process can be either passive or active (organizations can simply wait until somebody tells them about the change and its impact, or until the impact is directly felt, or they can actively seek out as much information from external sources as is available). For example, in the case of organizations responding to an earthquake prediction, some will basically ignore it until another organization directs them to respond, or until the impact is felt in decreasing revenues, profits, or even an earthquake. Others will actively seek out information – about the credibility of the prediction, about the government and citizen response – and attempt to assess the impact that these changes will have on the organization. It is this sort of active behavior that we will call environmental monitoring – being hit over the head with environmental impact does not count.

The next and more active type of adaptive response is defensive responsiveness or defensive change. These are changes made in an organization's behavior or planned behavior that are meant to protect the organization from any possible negative effects of the environmental change. Defensive behavior in response to an earthquake prediction, for example, might vary from changing location of the organization to an area of presumed safety, to decreasing the inventory and staff to minimal levels, or to implementing safety plans and precautions for the time of impact. Each of these examples suggests a different conceptual dimension of adaptation; in fact there are three: locational change, resource change, and normative change. Any or all of these categories of change might be pursued as a manner of protecting the organization from what is deemed to be a threatening change in the environment.

A third possible adaptive process is opportunistic change. This category is meant to include any organizational change which is meant to somehow enhance the organization's position in reference to its environment beyond what it had been before the environmental change, for instance, enhancing its autonomy, security, and/or prestige [2]. It should be noted that this definition differs from the more common definition of opportunism used in organization literature which refers to careless and short-sighted responsiveness without consideration of principles or long-term results. While my use of the term would include such behavior it also includes responsible, but quick, positive adaptation to external change.

Like defensive responsiveness, opportunistic responsiveness may involve location change (expanding to fill a void in an existing or newly forming market), a resource change (adding organizational resources to enable the organization to expand its production or service), or a normative change (for instance an enlargement of domain whereby an organization would begin performing new and different

functions within its environment). Any or all of such opportunistic changes may be made by an organization as a response to an environmental change together with or instead of defensive responses.

Finally, the last and most active response in this continuum is termed organizational activism – the process whereby an organization attempts to change the environment instead of or in addition to changing itself in order to maintain the equilibrium between itself and the environment. Types of activistic responses include attempts to change public opinion and/or behavior, attempts to change competitive, subordinate, and/or superordinate organizations' behavior, and attempts to change the political or legal structure to the advantage of the organization.

When considered together, these four types of adaptive processes form a continuum of organizational activism with respect to the environment which is similar to Thompson and McEwen's continuum of organization-environmental power (Thompson and McEwen, 1958). An organization which is not at all active, but which simply gets hit with surprise environmental changes and responds as it must is essentially controlled by the environment. At the other end of the continuum is the activistic organization which attempts to, and possibly succeeds, in changing portions of the environment to meet the needs of the organization. To the degree to which it succeeds, it approximates the organization which is dominant in all its environmental relations. To the degree to which it fails – and to the degree to which it responds with other types of adaptive changes, monitoring, defensive, and opportunistic change, it can be placed on a crude scale of organization-environmental power – a scale covering the middle part of the Thompson-McEwen continuum.

EXPLANATORY VARIABLES: WHAT DETERMINES RESPONSE?

As we interviewed organizations in our study of the Socioeconomic and Political Consequences of Earthquake Prediction, it became increasingly clear that organizations differed greatly in their placement on this continuum; some organizations indicated they would respond to the prediction in ways that covered all of the conceptual categories of activism, some indicated that they would essentially ignore it, and most were somewhere in between. What determined an organization's level of activism became a question of obvious interest. While past research did not have a specific answer to this question, the literature on organization-environment relations did suggest a number of possible explanatory variables. These variables, and the related propositions are summarized in the form of a causal theory shown in Fig. 1 [3].

While a number of the independent variables relate to two or more of the dependent variables, the sets of variables used to explain each of the response categories is considerably different. Thus for the purposes of discussion, we will divide the theory up according to dependent variable and discuss each of these groups of propositions individually. Two things should be noted now though, while the theory is still being discussed as a whole.

The first is that there are three major independent variables, demand increase, demand decrease, and organization vulnerability to the environmental change which combine in various ways with two crucial intervening variables (flexibility and power) to determine the various types of organizational response [4].

Another important point to note is that environmental monitoring acts as both a dependent and an independent variable. It is dependent insofar as it is the first category of response on the activism continuum and is of interest by itself in that respect. At the same time it is thought to be a major factor in

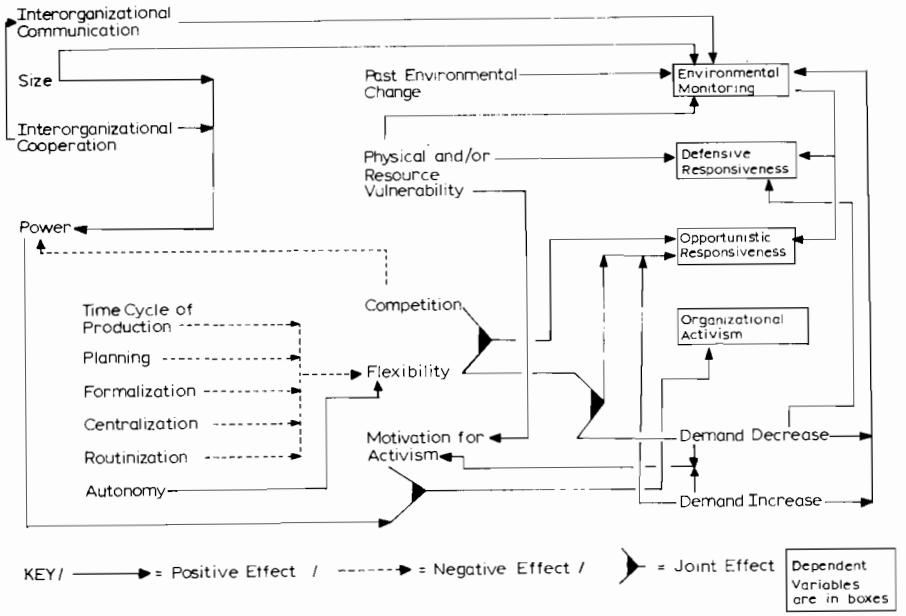

Fig. 1. An organizational response to environmental change: a theory

determining the other categories of response as well, in that organizations which do not know that the environment has changed can hardly respond to the change in any purposeful manner.

The rest of the discussion will be simplified by considering the dependent variables separately. Nevertheless, the reader is encouraged to refer back to Fig. 1 whenever necessary to review a particular variable's position in the overall scheme.

DETERMINANTS OF ENVIRONMENTAL MONITORING: PROPOSITIONS

Five variables are shown to be positively related to environmental monitoring; these are size, past organizational experience with environmental change, interorganization cooperation and communication, and vulnerability (including physical, locational, and demand vulnerability) to the specific environmental change.

The first variable, size, is suggested by Haas and Drabek (1973) as being positively correlated with environmental monitoring. They suggest that the range of "member skills and competencies" limit the extent to which an organization can monitor the environment, thus an increase in organizational size (as measured in terms of numbers of members) increases the likelihood that such monitoring will take place.

The second variable suggested to be positively related to environmental monitoring is past organizational experience with environmental change; this is meant to be a partial operationalization of the more common and more difficult to measure variable of environmental complexity and rate of change, or "turbulence"

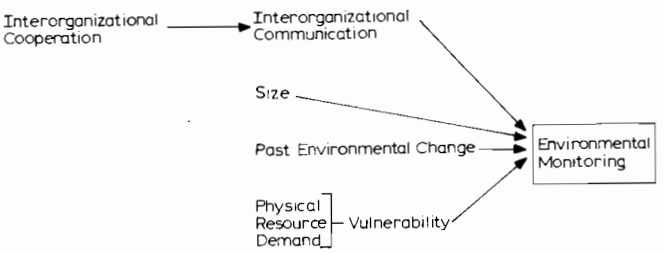

Fig. 2. Determinants of environmental monitoring: propositions

as discussed before with reference to Emery and Trist (1965). Mileti and Gillespie suggest that "an increase in environmental complexity [their term for turbulence] results in an increasing need for the focal organization to monitor the environment" (Mileti and Gillespie, 1976: 92). It is assumed here that surviving organizations with complex or turbulent environments will fulfill this need and thus organizations with much past experience with environmental changes will tend to monitor the environment more than those which are situated in a relatively stable environment, have had little experience with past environmental change, and thus have had little need for monitoring the environment before.

Another positive relationship links the amount of interorganizational communication (and further, the amount of interorganizational cooperation) with an increase in environmental monitoring. This relationship is not derived through precedent, but rather through deduction, the notion being that interorganizational cooperation necessitates interorganizational communication which is in itself a monitoring behavior. Thus the more cooperative links an organization has to other organizations (for instance, the more suppliers and customers a business organization has, or the more intra- and interorganizational councils a government agency belongs to) the more contact it has with its environment on an everyday basis and thus a greater amount of monitoring occurs along with other day-to-day activities.

Finally the last variable thought to increase environmental monitoring is vulnerability to the specific environmental change. This includes physical vulnerability (a threat to the physical well-being of an organization's property and/or employees), resource vulnerability (a threat to an organization's normal flow of resources, including raw materials, employees, operating funds, etc.), and demand vulnerability (a threat to the normal demand load of the organization which can either be a threat that demand will considerably decrease, i.e. business will drop off considerably, or a threat that demand will considerably increase, i.e. requests for products or services will go up substantially). If an organization perceives itself to be vulnerable to any of these types of threats, it is considered to be more likely to closely monitor the situation than an organization which expects to be unaffected by the mass emergency situation.

In terms of our earthquake prediction example then, we are suggesting that certain organizations are likely to investigate the prediction and its possible impact more than are others. These include large organizations, organizations with a great number of cooperative links with other organizations and/or great amounts of interorganizational communication, organizations which have experienced much environmental change in the past, and organizations which are, for any of a number of reasons, especially vulnerable to the environmental change. Organizations which are especially vulnerable to the earthquake prediction for instance, are organizations whose business it is to respond to mass emergency situations (the Red Cross, Federal Disaster Assistance Administration, state-level offices of emergency services and/or disaster planning, and local police and fire departments for example), organizations whose business is likely to severely decrease because of the prediction (construction and real estate firms, for instance), or organizations whose buildings or resources are threatened: (organizations situated close to the fault; organizations dependent on property taxes for revenue). Other organizations, such as nationwide business firms with only a small percentage of their assets in the area, are likely to be less vulnerable to the quake prediction and thus, other things being equal, they will monitor the prediction and its impacts less than the vulnerable organizations just discussed.

DETERMINANTS OF DEFENSIVE RESPONSIVENESS: PROPOSITIONS

The variables relating to defensive responsiveness are shown in Fig. 3. The four most important variables here are the organization's physical vulnerability to the environmental change, the vulnerability of its resource supply, demand decrease (one aspect of demand vulnerability), and flexibility of the organization, which is crucial to defensive responsiveness by being absent, rather than present. As we pointed out earlier, these are four of the crucial explanatory variables which combine in different ways to determine the organizational response to environmental change.

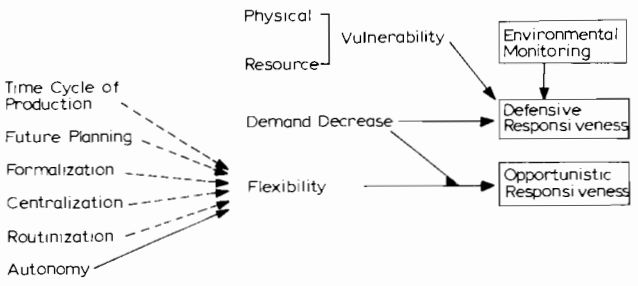

Fig. 3. Determinants of defensive responsiveness: propositions

The first proposition in this group is that physical vulnerability is positively related to defensive responsiveness, or to put it another way, an organization is expected to respond defensively if it is being threatened by an environmental change. In the instance of a credible earthquake prediction for example, an organization which is located on the top floor of a five-story unreinforced masonry building situated atop the San Andreas fault would likely consider either moving completely, relocating temporarily, or closing down during the period of the expected earthquake. Any of these solutions would be considered defensive responses, in that they would be meant to protect the organization from physical harm.

The second proposition states that resource vulnerability is similarly related to defensive response. For instance, city and county governments would probably face a decrease in incoming revenues from taxes in the event of an earthquake prediction. In order to remain solvent, agencies of these governments would have to somehow rearrange their funds, cut budgets, or attempt to get more money from alternative sources to make up the deficit. This also would most likely constitute a defensive response to the prediction (although obtaining more money from an alternative source might be considered an opportunistic response as well).

The third important variable is decreased demand, which also may cause an increase in defensive response. Construction firms, for example, are likely to suffer a severe demand decrease in the event of a credible prediction for a damaging quake, as few people will wish to erect a new building which may then be destroyed when the earthquake occurs. In order for a construction firm to survive such a business downturn (especially if it extends over a long period of time) it will either have to respond defensively (leaving the area, laying off workers, or cutting overhead costs for instance), or alternatively it can respond opportunistically (offering the construction of "earthquake-proof homes," offering building reinforcement services, etc.).

The crucial factor which is thought to determine which of these alternatives an organization will follow is the organization's flexibility; e.g. a flexible organization faced with a demand decrease is expected to respond opportunistically, whereas an inflexible organization in a similar situation is likely to respond defensively. Thus flexibility is crucial to defensive response in its absence, rather than presence, as pointed out before.

Unlike the other crucial variables we discussed, flexibility is an intervening, rather than independent variable, as it essentially is an index of a number of independent factors,

each of which contribute to the level of flexibility of an organization in different ways. For instance, formalization and centralization are both shown to be negatively related to flexibility as several organization theorists (Burns and Stalker, 1961; Hage and Aiken, 1970; Paulsen, 1974) have found them to be negatively related to innovation. Task routinization is a third related variable which is thought to work in much the same way to decrease flexibility. The time cycle of production and the amount of future planning are another two variables which conceptually link together; both tend to increase commitments to future behavior and thus decrease the flexibility of an organization in a secondary way. Finally autonomy is shown to increase flexibility, in that an organization which can make its own decisions is likely to be more flexible than one which is bound by the demands of other external organizations. These independent variables do not always vary together, thus some organizations will be high on some, while at the same time being low on others. It is hoped though, that a combination of these variables will provide a ranking of flexibility which will then combine usefully with the other explanatory variables to determine response.

The final variable which is related to defensive response is environmental monitoring which was discussed as an independent variable on a general level earlier. In addition to the reasoning used then, an additional note can be made here that interorganizational communication, one of the variables which leads to environmental monitoring, has been cited by Terreberry (1968) as correlating with adaptive behavior. Presumably this relationship occurs through the intervening variable of environmental monitoring (i.e. communication increases monitoring, which increases adaptation). Both defensive and opportunistic responsiveness can be considered means of adaptation; thus this theory conforms with Terreberry's in that respect. Mileti and Gillespie (1976) also suggest that an organization's ability to monitor the environment increases its adaptability which increases the level of organizational change. Thus environmental monitoring may be seen as an intervening variable which, along with other variables, causes an increase in defensive responsiveness and opportunistic responsiveness (organizational activism is treated with a different set of propositions).

DETERMINANTS OF OPPORTUNISTIC RESPONSIVENESS: PROPOSITIONS

Opportunistic response is thought to be generated in one of three ways. It can be caused by a decrease in demand, which will lead to an opportunistic response in flexible organizations (and to a defensive response in inflexible organizations as just discussed), by an increase in demand, which is thought to be a likely cause of opportunism in varying types of organizations, and to a combination of competition and flexibility, which, when the opportunity presents itself (an appropriate environmental change), is thought to encourage opportunistic responsiveness also.

The first relationship between demand decrease and opportunistic responsiveness has already been discussed. Demand increase is thought to cause opportunistic responsiveness simply because it presents such an excellent opportunity for such behavior, for instance, for the expansion of security, autonomy, and/or prestige. A few organizations undoubtedly would reject the opportunity and respond by

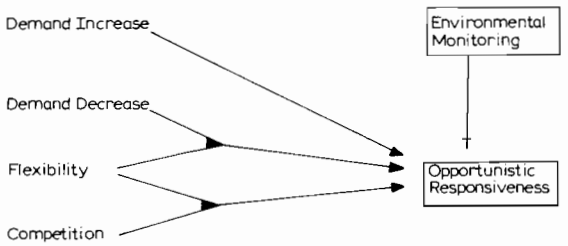

Fig. 4. Determinants of opportunistic responsiveness: propositions

backing away from the increased demand, but more, it is thought, would expand as necessary to fill the enlarged systemic role.

Finally, competition and flexibility are linked together in a manner similar to flexibility and demand decrease. Flexible organizations faced with a competitive environment and a massive environmental change are expected to respond opportunistically when possible to try to increase their competitive advantage. On the other hand, flexible organizations without competitors have no need to take the inherent risks of opportunism, unless, of course, they are threatened otherwise (for instance from decreased demand). Organizations with competitors which are not flexible, on the other hand, may not be able to respond opportunistically even though it would be advantageous to do so. Thus it takes a combination of factors, generally, to cause an opportunistic response to appear as a reaction to an environmental change.

DETERMINANTS OF ORGANIZATIONAL ACTIVISM: PROPOSITIONS

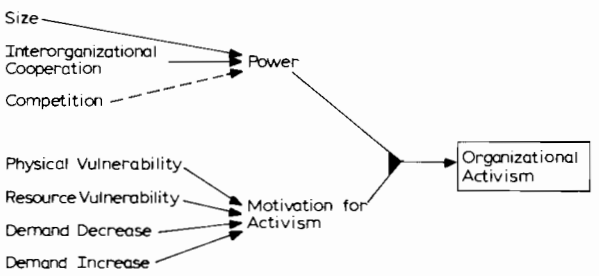

Fig. 5. Determinants of organizational activism: propositions

Two variables are predominant in the causation of organizational activism; these are power and motivation. Power here is being defined as the ability to alter another organization's behavior; thus the environment has power over an organization if it can alter the behavior, or structure (internal behavior in a sense) of that organization; similarly, an organization has power over the environment if it can alter the behavior of some external organization or other environmental unit (a law, for instance) [5].

Power derives from numerous sources, many of which undoubtably are not included here. But three variables are thought to be especially important and are included in the theory; these are size, interorganization cooperation and amount of competition (a negative relationship). Size is thought to be related to power simply because larger organizations tend to have more resources at their disposal, more people who are interested in their welfare, (employees and stockholders, for instance) and more people who are in need of their products or services (see Emerson's power-dependence theory, Emerson, 1962). Similarly, competition decreases power since it decreases the population's dependence on one organization for a particular product or service. Lastly, interorganization cooperation is thought to increase power because such cooperation increases the resources that any particular organization can bring to bear on its environment, while at the same time decreasing environmental uncertainty (see Allen, 1974; Turk, 1970; Perrucci and Pilisuk, 1970, among others).

Power is an important variable in this theory because an organization is unlikely to attempt to change its environment (respond activisticly) unless it perceives itself to have at least some possibility of success, that is, unless it perceives itself to have some power. While the perception of power and actual power might not always be the same, they are considered similar enough to be lumped into one variable, called "power" for our purposes.

In addition to power, the organization must also have a reason for exercising its power. This reason we are calling motivation for activism and suggest that it is caused by any of the types of vulnerability (physical, resource, or demand vulnerability). For instance, an organization whose physical safety or resources were threatened by an environmental change

might attempt to remedy the situation by changing the environment instead of itself, if it had the power to do so. Faced with an earthquake prediction for example, an organization whose building was threatened might pressure the government to provide free engineering evaluations to assess building safety and perhaps even request money, or more likely, an interest-free loan to strengthen the building if necessary. Or, a government organization whose income was decreased by decreasing tax revenues might lobby at the state legislature to get the ceiling on allowable tax rates to be lifted, so the income lost in "volume" could be made up in "price".

Demand vulnerability can provide motivation for activism also. For instance, in an earthquake prediction situation, demand is likely to drop sharply for real estate and construction firms in the area. To counter this drop they might well attempt public education campaigns aimed at convincing the public that earthquakes are not all that dangerous, that it is not all that likely, or at least clearly not certain, that an earthquake will actually happen, and that, for these reasons, this is an excellent time to buy real estate.

Demand increase too, can create a similar response. For instance, a utility company is likely to receive thousands of calls after an earthquake prediction requesting information and/or evaluations concerning utility safety. A public education campaign run through the media, or with pamphlets mailed with utility bills would bring this stressful situation back under control, while maintaining or even increasing the security and prestige of the organization in the public view.

Any of these above motivation factors, combined with enough power to expect some positive results is thus thought to increase an organization's activistic behavior. If either of these factors is missing however, the other response categories are more likely instead.

CONCLUSION

This paper has presented a conceptual scheme for the analysis of organizational response to environmental change which is thought to be somewhat different from most of the related schemes developed previously. Its primary differences are (1) that it discusses organizational adaptation to a quickly changing environment (as opposed to a static or slowly changing environment); (2) it discusses the response processes, not structures, that determine the nature of the organization-environmental field; (3) it addresses a fairly specific question (what determines the level of activism of organizational response to rapid environmental change); and (4) it proposes a specific falsifiable theory to answer the above question.

The values of this approach, it is thought, are three. First of all, the theory provides a framework for the analysis of organization-environment interaction which combines the ideas of two disciplines – organization theory and disaster research, which are areas of study that have been occasionally combined in the past. The result of the combination is a departure from the traditional theoretical patterns to a new pattern which appears to have fairly widespread applicability and usefulness.

Secondly, rather than limiting ourselves to a generalized discussion, we have presented the ideas of the framework in a clearly falsifiable form. Thus they can be tested, not only in our own study using data on the consequences of earthquake prediction, but in other areas of research as well.

Finally, it is also hoped that this framework will be of use to practitioners, specifically organizational decision makers who may face a potential mass emergency situation. Clearly the framework as it now stands is most useful in simply suggesting a way to conceptualize the range of responses available to an organization faced with a major environmental change. By considering all four types of

response in this framework, it is hoped that decision makers will have a better notion of the range of responses that is available to them, and thus help them choose the most appropriate response for their specific situation.

In addition the theory tentatively suggests what types of organizations will respond in what types of ways. Thus it suggests what might be expected of other competitive, or otherwise relevant organizations and indeed what the organizational response is likely to be in the community as a whole. Information of this sort can aid decision makers in their attempts to predict what future environmental changes are likely to occur in response to the initial mass emergency situation, and thus aid in the determination of what response on that particular organization's part is likely to be most appropriate and successful.

NOTES

1 For a much more complete review and integration of the organizational literature on organization-environment relations, sec Mileti and Gillespie (1976).

2 Haas and Drabek (1973) suggest that a continuous struggle for autonomy, security, and prestige underlies all organizational structures and processes.

3 Most of the literature which was used as sources of propositions stated the propositions as correlations, not causal relations, as we do here. Thus, few of these propositions have been previously investigated using causal (path) analysis, but rather only using correlational analysis. The specification of cause and effect does seem to make sense in this instance, though, and the propositions are suggested in the form of a causal theory which must yet be verified in this specific theoretical format.

4 Vulnerability is determined by so many situation-specific factors that it is treated as an independent variable here. Given a specific mass emergency situation, further variables can certainly be specified which themselves determine vulnerability in that specific instance.

5 This is different from the actual utilization of power, which is called organizational activism in this context.

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AN INTEGRATED SYSTEMS AND EMERGENT NORM APPROACH TO MASS EMERGENCIES*

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INTRODUCTION

A distinguishing feature of contemporary disaster research is the nature of its inquiry. Over the past 20 years or so it is possible to trace a transition from journalistic to descriptive studies of mass emergencies (Drabek, 1970: 335; Mileti, et al., 1975a: 1–3). More recently a second transition has been spawned in the direction of analytic studies (Barton, 1969; Drabek, 1969; Dynes, 1970; Haas and Drabek, 1970; Perry, et al., 1974; Mileti, et al., 1975b; Gillespie, et al., 1976). Considering the special problems of disaster research (Killian, 1956; Cisin and Clark, 1962; Drabek, 1970), it is clear that the difficulty of conceptualizing analyses is a major factor in the shortage of analytic research. Given the extreme dynamics of disasters, most of the standard "models" used in social science provide only limited or inappropriate conceptual frameworks [1]. Yet Kuhn (1962: 77–90) suggests that cumulative research will not emerge without some theory or model upon which to operate. The researcher without a model apparently can only describe (Brodbeck, 1959: 375–376), and without a conceptual scheme even description is no simple affair.

It is our purpose here to integrate a broad conceptual scheme – general systems theory – with an emergent norm conception of mass emergencies. The emergent norm approach, developed by Turner (1964: 389–392) as an alternative to the early contagion and convergence theories of collective behavior, emphasizes the parameters and processes by which a new or special norm comes to be established as the basis for collective behavior. The occasions for collective behavior are recognized as varying in their intensity, uniformity, and complexity. Situations where there are no established rules or directives, for example, promote the emergence of a new norm. Somewhat more complex and also more relevant to mass emergencies are situations where it is necessary to modify or replace an existing norm. Most natural disaster situations fall within this range of complexity. The most

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intense and complex situations facilitating an emergent norm are those such as riots, wildcat strikes, or violent outbursts where the existing social order must be overturned and opposed in order to implement intended action. While the specific conditions and processes will vary in these situations, the common denominator proposed in the emergent norm approach – recognition of a legitimating norm – helps us to specify system level outputs in a way that general systems theory by itself is unable to do. Thus, following a brief overview of the limitations to descriptive studies, a sketch of general systems theory and a discussion of its potential to the field of mass emergencies, we discuss the possibility of integrating the systems and emergent norm approaches.

LIMITATIONS TO DESCRIPTION

The goal in describing an event is to provide an understanding of what is happening (Becker, 1970: 189–192). A logical method of accomplishing this task is to divide the event into time sequences and describe the action in each sequence. This approach defines the research problem and permits a logical presentation and description of the events. Sequential description represents the method of much past and some current disaster research (Mileti, et al., 1975a).

Description of this type is a necessary first step in the development of research leading to theory, but it is only the first step. The sequences have been generally translated into a more sociological jargon called "stages". But the number of stages varies drastically between researchers; Fritz (1961: 351) presents four stages of disaster; Form and Nostow (1958: 13–14) mention three; Chapman (1962: 7) lists seven; and Dynes (1970: 67–68) argues that eight represents the appropriate number of stages to distinguish. An important factor in the variable views of stages is the different kinds of agents responsible for the emergency (Mileti, 1975: 6). Disasters resulting from different agents are described as having different numbers of recognizable stages. It would be inappropriate, for example, to describe behavior in the period of "threat" for an earthquake where there had been no prior warning to the population. The complexity of this issue is reflected in Mileti's (1975: 7–9) discussion of seven dimensions differentiating different kinds of disasters.

Mass emergencies are dynamic and change is more pervasive than can be adequately expressed by a stage model. But most of the work in this field is organized almost entirely around a series of stages and is primarily devoted to a description of what individuals and some organizations are doing during these time intervals. There are, however, numerous other dimensions upon which one may conceptualize observations, and some of these provide greater latitude in describing dynamic situations (Barton, 1969: 171–184; Dynes, 1970: 207–208). Moreover, a combination of these increases our ability to explain behavioral responses. The most impressive work on disaster classification and conceptualization thus far has been that of Barton (1969), who worked worked out a typology of disasters by cross-classifying four variables: (1) scope of impact; (2) speed of onset; (3) duration of impact; and (4) social preparedness. In contrast to the studies based upon a time sequence of stages, Barton's work permits us to more efficiently deal with large quantities of data precipitated by a variety of agents. But the major significance of Barton's work is that it moved disaster research from a descriptive basis to a larger theoretical context. That is, disasters become one type of collective stress situation and, hence, their connection to other sociological phenomena becomes apparent.

To reiterate, as the descriptive data on disaster began to accumulate, the need for standardization of both definitions and classification schemes became very apparent. The stage approach was quite functional in making manifest these needs but, by themselves, stages are not the solution. The need to develop a more

comprehensive model has not been met, however. As Mileti, et al. (1975a: 147) points out, ". . . a clear conceptualization of a theoretical paradigm of what a disaster is, what disaster phenomena are, and how disasters differ has yet to be developed." While one may identify some early system's influence (Form and Nostow, 1958), the trend has been slow taking hold. It is our thesis that by adopting a system's perspective, the disaster researcher can not only describe and classify disasters more effectively, but can also move toward a more analytic approach. The system's framework provides the constructs and concepts necessary to eventually evolve models for the prediction of individual, group, and organizational behaviors.

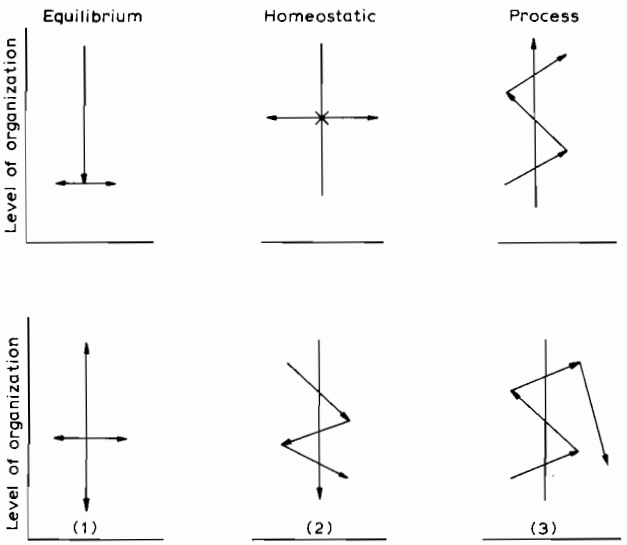

Fig. 1a. System Frameworks (adapted from Buckley, 1967, p. 40).

GENERAL SYSTEMS THEORY

General systems theory is an interdisciplinary approach which emerged in the years just after World War II (Von Bertalanffy, 1968: 11–14). Consequently, both systems theory and the systematic study of mass emergencies are relatively new. In considering the application of a systems approach to mass emergencies, the question of whether there is more than one framework and, if so, which should be used, must be answered. Buckley (1967: 37–40) points out that it is possible to identify at least three social systems perspectives currently used in social science: (1) equilibrium, (2) homeostatic and (3) process frameworks. Buckley distinguishes the three frameworks as follows (see Fig. 1a):

> The equilibrium model, strictly speaking, is applicable to types of systems which, in moving to an equilibrium point, typically lose organization, and then tend to hold that minimum level with relatively narrow conditions of disturbance. Homeostatic models apply to systems tending to maintain a given, relatively high, level of organization against ever-present tendencies to reduce it. The process, or complex adaptive system, model applies to systems characterized by the elaboration or evolution of organization; as we shall see, they thrive on, in fact depend on, 'disturbances' and 'variety' in the environment (1967: 40).

These distinctions involve three assumptions: (1) equilibrium models, if they change at all, decline in their level of organization; (2) homeostatic models maintain an unchanging level of organization; and (3) process models involve only the growth and not decline of organization. The problem here seems to be that the first two models represent static situations (which seem to be at variance with the definition of a system), and the most promising, the process model, implies that the only direction the system may move is toward higher levels of organization. Of course any time one tries to combine different schemes into a more simplified classification, some rigidity is likely to manifest itself in the scheme. But the rigidity resulting from Buckley's distinctions is greater in degree than is necessary or desirable.

Warren's (1963: 136–145) review of the systems literature indicates some important oversights in Buckley's classification [2]. Buckley uses the term "equilibrium" to designate a static, minimum level condition; but, as Warren (1963: 144) notes, "a system is in equilibrium, a dynamic state, when it is able to react to a change in such a way as to minimize that change's impact on the relations

of the units in the system." Thus the concept of "equilibrium" need not imply a minimum level or a lack of change. Figure 1 b (1) extends Buckley's equilibrium framework to include both change and varying levels of equilibrium. The different connotations attached to the concept of equilibrium illustrate the vagueness of this term (Haas and Drabek, 1973: 53) and its resistance to operationalization (Gillespie, 1972: 243). Moreover, it seems unlikely, given the empirical literature on organizations (Haas and Drabek, 1973: 265–300), that one can identify separate perspectives in which organizational change is always unidirectional or in which change simply doesn't occur. Drawing upon, for example, the organization-environment literature (Mileti and Gillespie, 1976), we can identify cases such as that represented by Fig. 1b (2), where the encounters between environment and organization lead to successive adaptations to decreasing levels of organizational complexity; Messinger's (1955) study of the Townsend organization provides an excellent illustration. On the other hand, we also find cases like that depicted in Fig. 1b (3), where the encounters between environment and organization lead in the beginning to increased organizational complexity, but at some point the organization collapses as was the fate of the Freie Gemeinde organization studied by Demerath and Thiessen (1966). These cases are at variance with each of Buckley's frameworks. It would thus seem that Buckley's scheme requires further elaboration. The most plausible of these frameworks is the process scheme, but it will be necessary to do away with the unidirectional growth assumption.

SYSTEMS THEORY AND MASS EMERGENCY

Barton's discussion (1969: 125–150) of the emergency social system makes use of the equilibrium concept and, at first glance, one may erroneously condemn it as another static model. Keeping in mind the problems of early researchers in applying nondynamic models to a dynamic phenomenon, it is apparent that similar to Warren's perspective, researchers of mass emergencies do not see the concept of equilibrium in a static sense. Barton's approach is a "process" framework, the operation of which may be conceptualized as follows: the predisaster system operates smoothly, a sudden change in inputs (a disaster) requires the shifting into operation of units not normally operative (a temporary maintenance function), which results in the reactivation of previously functioning units (and the simultaneous retirement of units temporarily activated), with the system returning to an equilibrium state. The final state of the system, however, is not a return to the state which existed before the disaster, but simply a different equilibrium. This is similar in some respect to the "strain-stress" perspective advanced by Haas and Drabek (1973: 238–239).

An important advantage of the systems approach to disaster is the ease with which the investigator is able to move from one unit of analysis to another (i.e., group – individual – community – city – state – nation) and still effectively use the system as a scheme for analysis. Of course, as mentioned above, the transition from one unit to another is a problem which system theorists have not yet sufficiently resolved. In extending their initial "system stress" formulation (Haas and Drabek, 1970; 1973) these researchers and their colleagues suggest that, ". . . we must differentiate varied stress levels and recognize that within a single event, different subsystems may be experiencing very divergent levels of stress. Comparing all [units] as if the stress levels were similar is ultimately not informative (Mileti et al., 1975a: 148)." Nevertheless, we may take a macro- or micro-view and not be forced to change models or theoretical orientations. It is also possible to begin to note variations in "system response" to particular inputs.

Barton's four variable classification scheme (1969: 40–47), noted above, represents various

input variables, the combination of which results in different system reactions. For example, the WII German bombing attacks on London (gradual onset, total scope of impact, short duration of impact, and high social preparedness) would result in a different system reaction and hence different relationships between units in the emergency social system than the 1955 Beecher tornado (sudden onset, segmental scope of impact, short duration of impact, and low social preparedness). The key observation to be made here is that, with the adoption of a system model, we need not be forced to recognize only variations in individual and organizational response to disaster; we can also classify and catalogue such reactions for further study.

Barton presents a view of "the emergency social system", describing the behavior of individuals, groups, and formal organizations in the face of a sudden change in the inputs to a social system. To facilitate further examination of Barton's system, it is useful to select one type of disaster and examine it. The system to be dealt with here entails a reaction to a sudden onset, short impact duration, segmental, low social preparedness disaster. The relationship between the emergency social system and the larger social system is crucial for system stability: the output of the emergency social system equals the auxiliary inputs of the larger system.

A point of concern for disaster researchers becomes the units, and the relationships between these units, of the emergency social system. Barton (1969: 131) identifies five "units" which operate in the functioning of the systems:

(1) Rate of Nonadaptive Behavior

This unit refers to behavior which does not contribute to family role performance, an organizational role performance, or to the performance of a community role. In disaster situations there is generally a very low rate of nonadaptive behavior. Numerous studies, for example, document a low rate of panic in disaster (Quarantelli, 1954; Fritz and Marks, 1954; Fritz, 1961; Martin, 1964; Dynes, 1970; Form and Nostow, 1958; Drabek, 1968).

(2) Rate and Quality of Organizational Member Role Performance

Reference is here made to performance tasks by members of formal organizations, including voluntary associations. In general, Haas and Drabek (1973: 253) hypothesize that, "as organizational stress increases, changes in organizational performance structure will occur" (cf. Drabek and Haas, 1969; Haas and Drabek, 1970; Spiegel, 1957; Dynes, 1966; Brouillette and Quarantelli, 1971).

(3) Rate and Quality of Family Role Performance

This unit deals with the tendency of individuals to perform roles related to the family before engaging in other role behavior. Killian's (1952) study of role conflict concludes that, other things being equal, an individual performs his family role before engaging in other behavior (see also Form and Nostow, 1958: 66; Fritz, 1961: 675; Fritz and Williams, 1957; Moore et al., 1963; Drabek, 1968; Dynes, 1970; Quarantelli and Dynes, 1972: 68; Mileti et al., 1975a: 69–70).

(4) Rate and Quality of Community-Member Role Performance

This unit may be thought of in reference to the "altruistic" community, the tendency of community members to "help other community members" (Barton, 1969: 233). Altruism, affection, cooperation, and group solidarity have been frequently observed following disasters (Martin, 1964; Kutak, 1938; Menninger, 1952: 129; Taylor et al., 1970; Mileti et al., 1975a: 65).

(5) Mass Convergence

This represents the tendency of people not affected by the impact of the disaster to converge upon the scene for a variety of reasons, for example, to see the damage, to help, to look for relatives, and so on (Fritz and Mathewson, 1957: 29; Fritz, 1961: 678; Wallace, 1957; Dynes, 1970: 207–208; Mileti et al., 1975a: 86).

The framework as presented represents only a crude outline. Barton subdivides each unit into various component parts, but an evaluation of these components is not necessary for our purpose. Barton derived these units from the literature on disaster; the hypothesized relationships between the units (shown in Fig. 2) were also derived from the literature. It is reasonable, then, to treat the system framework and related hypotheses as "given" and explore their implications for a different theoretical work; namely, the emergent norm approach.

IMPLICATIONS OF A SYSTEMS MODEL FOR THE EMERGENT NORM APPROACH

The emergent norm approach (Turner, 1964) suggests two questions which may be posed regarding the hypothesized relationships between system units: (1) while there is an implied negative relationship between the informal mass assault and the effectiveness of formal organization activity, is it not possible that this relationship be positive? (2) Does the mass convergence necessarily have a negative effect upon the effectiveness of the informal mass assault? To answer these questions requires a brief prelude of the central tenants of the emergent norm approach.

The emergent norm approach holds that people operate on a set of norms which permit and guide both individual and organizational behavior. If something happens to make the normative structure inappropriate or partially inoperative, people will define a new and hence emergent structure, altering their behavior accordingly. The scheme indicates an established structure, the destruction of this structure, and then the emergence of a different structure (see Fig. 3a). This framework corresponds to the disaster research findings, with the disaster representing the "crisis" in Fig. 3a. The only necessary modification is the need to include established organizational activity.

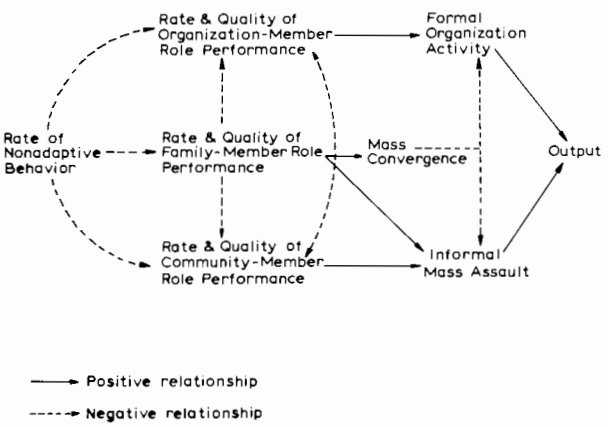

Fig. 2. The Emergency Social System (Barton, 1969, p. 227).

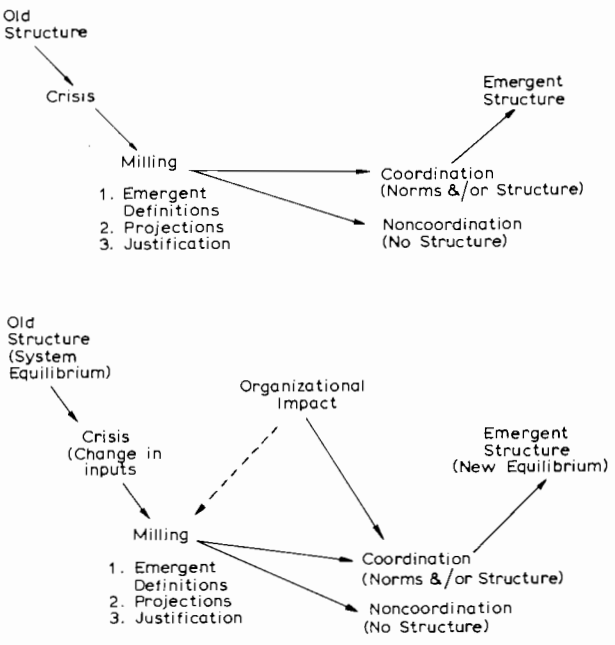

Fig. 3a. Emergent Norm Approach.

Fig. 3b. Emergent Norm Outline Taking into Account Outside Organizational Activity.

By introducing established organization activity, as shown in Fig. 3b, we achieve an explicit linkage between the emergent norm approach and Barton's system framework; the implication of this linkage will be discussed below. The impact of established organizations would be principally felt at the point of coordination as this is one of their major functions and they have a system of procedures which defines the situation (Haas and Drabek, 1973: 166). One could argue also that some influence would be felt at the milling stage in the case of an emergency operation organization which maintained members to organize search and rescue operations.

The most interesting point is the lag in time between impact and the appearance of representatives of established organizations upon the scene (Raker et al., 1956). The longer the time lag, the more time the residents and people who were in the area at the time of impact would have to organize, and thus they might be seen by the established organizational representatives as competing operations in search and rescue. Dacy and Kunreuther (1969: 94) and Dynes (1970: 179) have noted that many organizations will confront surpluses of volunteers who, while highly motivated to help, cannot be easily integrated into the organizational task structure. Similarly, Demerath and Wallace (1957) indicate that organizations can be hampered by excessive "assistance".

These developments, of course, may be quite limited due to the lack of equipment on the part of the victims, and because of the inevitability of the appearance of established organizations; but the beginning of relief, search, rescue, and medical operations could no doubt be established. In this light, we may reconsider Barton's hypothesized negative relationship between the Formal Organizational Activity and the Informal Mass Assault. Since the operations provided by numerous organizations would be started according to the emergent norm hypothesis before the organization reaches the scene, it is possible to hypothesize that much of the success of established organizations depends upon how well they can integrate their personnel into the ongoing operations of the victims. This implies a positive relationship between the units. That is, the effectiveness of the established organizations would be enhanced by the local citizens' knowledge of the environment, early preparation, additional personpower, and so on.

Some support for a positive relationship between established organizations and informal units, assuming certain response patterns, may be drawn from Form and Nostow's work on the Beecher tornado. In the development of police evacuation units, Form and Nostow (1958: 141) indicate that "by the time the emergency headquarters were established approximately three quarters of the dead and injured had been removed by civilian volunteers." More generally, Form and Nostow (1958: 112) indicate that ". . . organizations that arrived on the scene soon after the impact . . . were successful to the degree to which they fitted themselves into the rescue pattern already established by the local groups." Studies by Clifford (1956) and Warheit (1968) reached a similar conclusion. The point is that people were in the field and already operating services before any established organization members arrived at the scene. Also, any activity on the part of citizens must be integrated into organizational structures (Brouillette, 1971: 178–180). The speed with which this is accomplished and hence the speed with which each organization reaches its maximum output may depend upon how skillfully the organizational representatives in beginning their work can avoid conflict with emergent groups. The established organizations must integrate, adopt, or abolish the emergent structures in order to reach organizational goals. In short, failure to integrate such units will retard their own effectiveness. Rather than representing a resource through which the established organization could increase its effectiveness, such informal groups too often remain viewed as "part of the problem."

The second question relates to the effectiveness of the mass convergence relative to the informal mass assault (emergent groups). No doubt people entering the area, representing the mass convergence, initially provide a positive impetus to "mass efforts." Personnel for manning the rescue parties and other operations of a mass structure have to be recruited from somewhere and the mass convergence provides a steady flow. At some point though, saturation is reached and the convergers begin to get in the way (Dacy and Kunreuther, 1969; Dynes, 1970; Demerath and Wallace, 1957). This situation is complicated by the fact that by the time saturation is reached, the established organizational personnel have arrived on the scene and are trying to "organize" operations. From this point on then, the mass convergence is dysfunctional for both established organizations and emergent groups. What exists, exists, then, is an apparent interaction effect in that initially the mass convergence provides manpower, a positive relationship in terms of resources, but later they stand in the way of a rapid integration of informal emergent groups into the established organizations which is a negative relationship with respect to effective service delivery. The changes that have been proposed here are represented in Fig. 4. The preponderance of positive relationships between the informal mass assault unit and

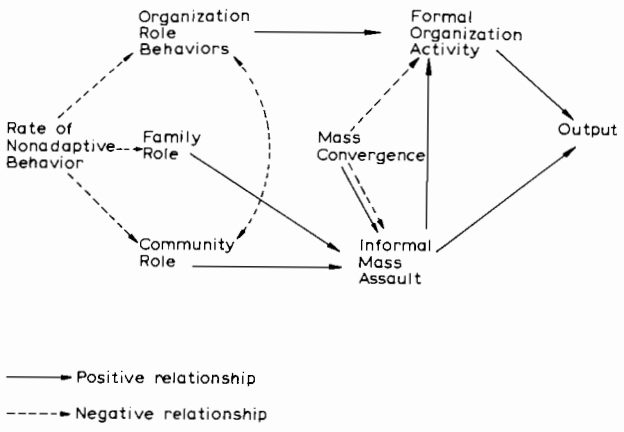

Fig. 4. Changes in Unit Relationships for Barton's System Framework in View of Emergent Norm Considerations.

other units of the emergency social system seems to emphasize the role of "emergent" mass behavior in the system's output. Verification on these points is yet to come (Mileti et al., 1975a: 144–148). It will come when we are able to lift the disaster literature from its descriptive level to the more powerful analytic level.

Analytic studies are distinguished from descriptive studies in that they are framed in a design of logical proof (Gillespie et al., 1976: ii). We have shown the value of using analytical frameworks to guide research. But it has been also implied that such theory and research have a parallel use in guiding policy and administrative planning. Executing an effective response to disaster, for example, depends upon knowledge of how people, groups, and organizations behave prior to (when warned), during, and after mass emergencies. Information of this type can provide for advanced preparation and the discovery of improved ways to avoid bottlenecks in various attempts to gear up, provide relief, and return the stricken community to a stable condition. Redefining local citizens and groups as a resource instead of viewing them as part of the problem suggests a fundamental policy change and a host of possibilities for enhancing effectiveness. Policy and planning for mass emergencies has for too long been tied to short term, post hoc, experiential responses and adaptations (Fritz, 1961: 659; Parr, 1969: 26; Haas, 1970; Mileti et al., 1975). Predicting an early utility but also a point of diminishing returns in mass convergence permits advanced structural planning to optimize this resource. These suggestions, of course, simply crack the crust. But they are enough to indicate that by conceptualizing analytically what we know about responses to mass emergencies, we can push the practitioner into a new approach to disaster planning; a preplanned and proactive response to mass emergencies.

NOTES

1 The "system stress" model advanced by Haas and Drabek (1970; 1973) represents a recent and noteworthy exception. But, as noted by Mileti et al., (1975a: 148) ". . . researchers using this orientation have yet to resolve many of the definitional and measurement issues . . . [and] it does not appear fruitful to assume that [a] community will experience equal levels of system stress . . .".

2 Warren compares the work of Homans (1950), Loomis (1960), and Parsons (1951) on various points relative to systems theory. The extraordinary accomplishment on Warren's part is that unlike many social scientists (who chose to focus on differences between theorists), he manages to highlight the numerous similarities between the approaches and in so doing doesn't leave one feeling that there is no hope for the future (in the sense that everything is so different that problems can't be resolved and research can't continue).

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HAIL AS SUDDEN DISASTER: PUBLIC RESPONSE TO HAIL SUPPRESSION ACTIVITY*

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INTRODUCTION

Farmers in northeastern Colorado refer to hail as "sudden poverty." This is understandable since they live on the lee side of the Rockies where catastrophic hailstorms can mean the difference between survival and nonsurvival on the land. Here, and in other parts of the United States, hail causes millions of dollars in losses every year with the concomitant social consequences stemming from catastrophic loss.

In this paper we will examine briefly the severity of the hail hazard in the United States, its geographical distribution, and some possible adjustments to hail that have been or could be attempted. The remainder of the paper will focus on one of these adjustments – hail suppression. Projects in the Blue Ridge area, the San Luis Valley of Colorado, and in South Dakota will be reviewed briefly with the focus on public response to them. These case studies reveal how societal processes may affect the application of a technology toward the reduction of a hazard.

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THE SEVERITY OF THE HAIL HAZARD IN THE UNITED STATES

Economic losses from hail are usually divided into two categories: crop loss and property loss. Annual crop loss in the United States is estimated to be from $600 to $700 million (2% of crop value) and property loss from $76 to $150 million (White and Haas, 1975; Friedman, 1976; *Science*, 1976). Not only is 2% of the United States crop directly lost annually through hail, but secondary losses (decreases in economic activity related to grain elevators, the transportation industry, and the like) are also incurred (Changnon, 1976). The social consequences of sudden and extensive hail are not well understood at present. While hail is virtually never responsible for human death, it does cause disruption in the form of economic nonviability of farm families, foreclosures, and the like. Social impacts of hail must not be ignored in our consideration of the seriousness of the hail hazard.

Hail is a sporadic climatological phenomenon, occurring seemingly without a spatial pattern. On any given day during the hail season (April to September), damaging hail occurs at widely

scattered points across the nation. The ten leading crop hail damage states are Illinois, Texas, Iowa, Nebraska, Minnesota, Kansas, North Dakota, North Carolina, South Dakota and Colorado (Changnon, 1976). Hail is an increasingly important natural hazard with trends toward a worsening situation.

POSSIBLE ADJUSTMENTS TO HAIL

Several alternative responses to the problem of hail in the United States exist (Brinkmann, 1975). Potential adjustment mechanisms include: (1) modification of the environment, (2) modification of human behavior, and (3) modification of the weather.

With regard to modification of the environment, Brinkmann considered the possibility of farmers growing crops less subject to heavy hail damage in certain areas of the country where high hail damage occurs. She concluded, however, that neither alteration of prevailing cropping patterns nor development of new hail-resistant strains of plants offered much promise.

Improved forecasting would fall under modification of human behavior. But Brinkmann concluded that, "in general an improved hail forecast warning system would not be very effective in significantly reducing damages" (p. 82). Even with perfect forecasting, there is little a farmer can do to prevent the crop from being damaged. However, forecasting in juxtaposition with effective hail suppression could prove to be significant in the prevention of damaging hail.

For the individual farmer scattered (noncontiguous) land holdings could protect him from catastrophic loss given any discrete hailstorm situation but this approach cannot protect the nation from the loss of the crop. Over 80% of the nation's crop value is not insured for hail loss (Brinkmann, 1975). Furthermore, the pattern of insurance purchasing is such that farmers in high-risk areas are much less likely to buy insurance than others (p. 85). In 1969 about 20% of the hail losses experienced were recompensed either by commercial stock and mutual companies or the Federal Crop Insurance Corporation. Apparently hail insurance premiums are perceived to be too high for most farmers to utilize insurance in a widespread fashion. Federal emergency assistance to farmers is available when an area is declared a major disaster area by the President but damage from hail alone is generally not sufficent to warrant a presidential disaster declaration.

Hail suppression through cloud seeding has been identified as the potentially most promising area for future research regarding the hail hazard (White and Haas, 1975). Although there has been some optimism in the scientific community about the prospects of a technology to reduce damaging hail, and although commercial cloud seeders have carried out operational hail suppression programs in various parts of the country, hail suppression is still a matter of scientific uncertainty (*Science*, 1976). Some positive empirical results have been reported in the literature (Changnon, 1976), but none have achieved a level of statistical significance accepted by most scientists establishing that damaging hail at the ground has been reduced by silver iodide seeding. In fact, the randomized experiment underway in northeastern Colorado, the National Hail Research Experiment (NHRE), has, to date, found no statistically significant reduction of hail as a result of cloud seeding. There remains a possibility that seeding has actually increased hail from some of the storms. Therefore, the current "state of the art" in hail suppression is a matter of scientific controversy. Even so, during the last 15 years, some 60 hail suppression projects have been carried out in the United States – about two-thirds of them for operational and one-third for experimental purposes. Public experience with hail suppression technology is thus quite limited, although hail suppression projects have been carried out in Colorado, Kansas, Nebraska, North Dakota, South Dakota, Texas, and elsewhere. Several of these projects have generated

increased public interest, at times quite intense. We turn now to a consideration of several cases where hail suppression has been applied.

PUBLIC RESPONSE TO HAIL SUPPRESSION PROJECTS

The sociological aspects of weather modification have been studied since the late 1960s; two longitudinal surveys of populations experiencing hail suppression have been taken in northeastern Colorado (Haas and Pfost, 1972; Haas and Krane, 1973a, 1973b; Krane, 1975) and in South Dakota (Farhar and Krane, 1973; Farhar and Mewes, 1974, 1976). Other projects have been monitored by social scientists studying acceptance/rejection processes. Hail suppression has been accepted in northeastern Colorado, Kansas, and North Dakota; it has been the focus of controversy and organized opposition in the San Luis Valley of Colorado, the Texas panhandle, South Dakota, and the Blue Ridge area. Opponents in these local areas have felt that hail suppression resulted in reduced rainfall, or that it did not effectively decrease hail (Farhar, 1976; Mewes, 1976).

Selected for discussion here are three cases, representing areas where hail suppression has become a controversial issue. The three cases, the Blue Ridge case, the San Luis Valley case, and the South Dakota case, involved *operational* (not experimental) cloud seeding. Several important factors concerning social response to hail suppression are highlighted by these cases. First, each case involved heterogeneity of weather needs. That is, within the project area, some crops at certain periods of time benefit from additional rainfall while others would suffer damage from rainfall at that time. Range or pasture may benefit from moisture deposited by hail, while crops would be hail-damaged. Heterogeneity of weather needs is the basis for system-level conflicts of interest with regard to planned intervention in weather processes.

Second, in each case a drought or dry weather conditions developed while cloud seeding was implemented. Opponents were inclined to attribute such conditions to cloud seeding for hail suppression. Those conducting the cloud seeding deny these allegations, stating that, if anything, seeding for hail suppression should increase rainfall in the target area.

Third, each project was carried out in a context of scientific dissensus about the readiness of hail suppression for operational application. Adoption of hail suppression requires a collective decision on a scientifically uncertain technology. The uncertainty implies that a degree of risk is involved (the degree may be quite limited, but may be said to exist); in general, risk-takers prefer to adopt their own risks, rather than have such decisions made for them.

Fourth, the degree of public participation in the adoption decision varied in the three cases. In Colorado and the Blue Ridge Area, voluntary associations of agriculturists (irrigating farmers in both cases) raised funds and contracted for hail suppression with a weather modification firm. In South Dakota, the adoption decision was made at the county level by county commissioners. It is probable that the degree of participation for residents as a whole in the adoption decision in all three areas was not high.

Fifth, it is noteworthy that in all cases, adoption occurred in high hail loss areas – areas where hail destroys up to 20% of the crop. Willingness to adopt an uncertain technology – one perceived as potentially ameliorative and possessing a low probability of causing damage – is clearly enhanced in areas where hail is a serious problem.

Sixth, in all three cases, the credibility of those supporting and running the programs was called into question by opponents resulting in a polarized community situation. Arguments raged over both the technology's effectiveness and how decisions were made to adopt it. Organized opposition emerged in the three cases; in all three the opposition groups were successful in halting the projects.

Hail Suppression in the Blue Ridge Area

In the summer of 1956, in response to severe hail damage to fruit orchards in the Blue Ridge area (which included portions of West Virginia, Maryland, Pennsylvania and Virginia), a group of orchardists incorporated a nonprofit organization called the Blue Ridge Weather Modification Association. This group contracted with a commercial cloud seeding firm to conduct an operational hail suppression program from May to August 1957 supported by voluntary contributions.

Besides fruit crops, dairy farming was the other major economic interest in the area where cloud seeding was conducted. There is some evidence to suggest that the orchardists who were relatively well-off had strained relations with the dairy farmers who were somewhat less prosperous. The dairy farmers relied on pasture land tending to benefit from hail moisture, while fruit crops can be quickly ruined by hail.

As events unfolded the first operational year, was extremely dry in and around the target area. The belief began to develop that cloud seeding was suppressing clouds capable of producing rainfall in order to eliminate the danger of hail. Letters to the editor opposing the cloud seeding began to appear in the local newspapers and the topic came up in discussions at local organizational meetings. However, from 1958 through 1961 adequate rainfall was experienced in the general area while the hail suppression project continued. During this period, opposition was largely forgotten, suggesting a link between the formation of opposition and the existence of local economic hardship caused by negative weather.

In 1962, however, a drought reoccurred, and the opposition intensified (Howell, 1965a). Respondents in our study have alleged that program sponsors were the recipients of anonymous threats, acts of vandalism (such as the destruction of fruit trees and poisoning of farm ponds), and other harrassment. Several groups opposing the "weather tampering" organized.

The summer of 1964 saw an extremely dry period in the entire northeastern United States, so that the issue of rainfall became central, even though the weather modifier claimed he was increasing rainfall in the project area by 14% (Howell, 1965b).

A number of public meetings provided forums for arguments against intervention in natural weather processes and for farmers' rights to experience weather in its natural form. A number of townships passed local ordinances banning cloud seeding activities within their jurisdictions. A generator operator was arrested, tried, and convicted of violating such an ordinance (Davis, 1974).

At about the same time, an injunction was sought against the hail suppression project by an opponent group. The injunction was denied, but state statutes effectively discouraged cloud seeding in the area and none has been carried out since 1969 to our knowledge.

Nevertheless, opponents have continued to believe that cloud seeding has been carried on in the Blue Ridge area. In 1968 the Tri-State Natural Weather Association was organized. The Tri-State group vetoed violent activity as a matter of policy, and has instead focused its attention on political, legal and public information efforts against cloud seeding. The organization has produced a number of brochures which have been made available not only locally but to opponents in other parts of the United States (Tri-State Natural Weather Association, n.d.; Kinter, 1970).

From the Tri-State group's point of view, there is a conspiracy of private and public interests to carry out cloud seeding to help ensure dry weather conditions. The failure of official investigations to uncover any illegal cloud seeding activity has not been convincing to the opposition. Today, a decade later, the Tri-State Weather Association is still active in spreading its message about the dangers of cloud seeding to other opponents throughout the country with whom they come in contact.

San Luis Valley, Colorado

In a normal climate of scanty annual rainfall (6.5 inches) and relatively frequent occurrence of damaging hail, cloud seeding was introduced for a short time in the San Luis Valley. Opposition soon developed on the basis that "abnormal weather" was occurring, primarily drought. Subsequently, lettuce growers financed a hail program for two years, but sponsors felt that the program was too expensive to maintain.

In 1967, a weather modifier persuaded the Coors Brewing Company of Golden, Colorado, that a weather modification program could aid the brewing barley crop grown in the San Luis Valley. Since hail (or moisture in any form) is particularly damaging to barley during its ripening stages, the brewery was interested in what could be done to protect the crop. A project was implemented in 1969 with three purposes: first, to increase precipitation during the growing season; second, to decrease precipitation at harvest time when moisture could damage the ripening barley; and third, to suppress hail throughout the growing season. Thus the weather modifier himself agreed to decrease rainfall, a potent source of opposition in an area where 75% of the local economy was dependent on ranching. The modifier apparently claimed that it was within his technical ability to control a variety of severe storm situations, including tornadoes, hail, high winds, and heavy rains (Flavin, 1971).

Not long after, an independent insurance company was formed to insure against hail damage and fund hail suppression. But after two years, the insurance company ceased to exist after extensive claims for hail damage. Subsequently, Coors informed the barley growers that they were to be responsible for the support of continuing a hail suppression program, a prerequisite for Coors' continued purchasing of valley barley.

During the period the weather modification operations were underway, the entire Southwest was experiencing a drought which became more severe during 1971. The underground water table dropped resulting in a critical effect on range plants whose roots could reach the water table under normal conditions and who were now beginning to die. During this time ranchers experienced excessive problems in pasturing cattle.

The economy of the Valley was far more dependent on ranching than it was on the barley or lettuce crops grown there. Ranchers were more dependent on natural precipitation than were the irrigating barley growers, and this heterogeneity of weather needs was basic to the entire course of events in the Valley. In addition, there were many Valley residents who were either skeptical about the efficacy of cloud seeding to produce beneficial results or who were opposed to any intervention whatsoever in natural weather processes.

Ranchers and timber interests in the valley and on its periphery had not been included in the weather modification decision process. These important local interest groups felt they were being economically damaged by the cloud seeding operations, and that they had had no means of making their position effectively felt in connection with the cloud seeding project.

An opponent group, organized in 1970, affected the choice of a new firm to carry out the cloud seeding. But other opponents were still not satisfied and a new opposition group formed in 1972. Its president was a rancher from an old-line Valley family.

There had been debate among the weather modifiers involved in the cloud seeding program over the years about the project's purposes and the technical capability to carry them out. The controversy was reported in the local media and citizens of the area became aware that meteorologists were not necessarily in agreement about the state of the art.

In 1972, opponents in the valley were influential in getting legislation passed regulating weather modification in Colorado. The law provided for public hearings in the project area

prior to the granting of project permits. The first such hearing was held in the Valley on July 31, 1972, with about 600 in attendance. Subsequently, a permit was approved and two weeks later a trailer containing project equipment was dynamited, causing about $50,000 damage. Although state and local authorities investigated the incident, no one was ever arrested for the bombing.

The following March, a second public hearing on the permit for the 1973 season was attended by about 300 persons. The strongest ammunition the opponents had was the result of a straw vote taken the previous November during the general election. Ballots from a five-county straw vote had resulted in an overwhelming negative response: citizens voted against weather modification four to one.

Even though the vote had no legally binding power, it was cited by officials as the major reason for not granting the permit for the 1973 season. Upon appeal, the decision was upheld in court. No further summertime weather modification has been conducted in the valley despite threats by the Coors Company to decrease the amount of barley purchased there by 10% each season that weather modification was not conducted.

Hail Suppression in South Dakota

In South Dakota, citizen interest in cloud seeding to ameliorate weather conditions has a history dating back to the early fifties when weather modification was being carried out in a third of the state's counties. There is no record of any active opposition to the research projects which spanned more than a decade, culminating in the initiation of a statewide cloud seeding program in the spring of 1972. The legislature appropriated funds for the development of the program, called the South Dakota Weather Modification Program (SDWMP). Between 1972 and 1975, funding increased from a quarter of a million dollars to about a million dollars. The number of counties involved increased from 26 to 47 during that interval. The conviction that county government should decide county participation in the program originated at the state level from the outset. The purpose of the SDWMP was to suppress hail and increase rainfall, with hail suppression having operational priority. The county provided 25% of the cost of operation through mill levy taxes and the state contributed 75% from the general fund.

Our research group has monitored public response to the SDWMP since before the program's initial operations (Haas, 1973). A longitudinal survey of a random citizen sample in 20 participating counties was conducted over four time periods between 1972 and 1974. Some of the results of the survey and monitoring efforts are as follows (Farhar and Mewes, 1976). Prior to the beginning of the SDWMP the survey showed majority favorability to the idea of modifying the weather for the benefit of agriculture in participating counties. Between the first and second waves of survey interviewing, the Rapid City flood occurred in a period of cloud seeding on June 9, 1972. An official report on the flood stated that cloud seeding did not contribute materially to the flood occurrence. Most respondents when interviewed in the fall of 1972 did not attribute the flood to cloud seeding. Also, by that time, respondents were more convinced than they had been earlier that cloud seeding could actually increase rainfall and decrease hail. But, by the September 1974 interview, belief that cloud seeding could actually increase rainfall had fallen off somewhat and evaluation of cloud seeding was somewhat less favorable than it had been in earlier interviews.

Concern about side effects and the religio-natural orientation – the belief that weather processes should be left up to nature or God, free from human intervention – were the most important factors in determining respondent evaluation of cloud seeding prior to the SDWMP's inception. Over time, however, these concerns were replaced in importance by per-

ception of project effects themselves. Perceptions of cloud seeding's effectiveness and economic consequences became the most relevant factors in how projects were evaluated.

Throughout the survey the majority of respondents indicated their preference that the decision to participate in a cloud seeding program be made by or shared with local levels – the people to be affected by the program.

A policy of active information dissemination had been adopted by the Division of Weather Modification. But, levels of awareness about program activity in South Dakota remained low throughout the course of the study. The relationship between increased knowledge about weather modification and favorable evaluation appears to be one of no direct correlation. Those becoming more knowledgeable become more strongly opposed or more strongly favorable.

In fact, after three operational seasons, organized opposition to weather modification developed in South Dakota with the formation of a group called Citizens Against Cloud Seeding. The opposition formed in a context of overall public favorability (in the 20 participating counties) to the idea of modifying the weather, but it was initiated and supported at the grassroots level by farmers and ranchers in different locales who felt the program was damaging them economically. The major damage attributed to cloud seeding was drought.

Opposition activity continued through the 1975 operational season with public meetings, letters to the editor, television appearances, and circulation of petitions throughout many counties of the state. While the opposition did not emphasize the hail suppression component of the SDWMP, there were contentions that the cloud seeding either increased hail or failed to reduce it and that it reduced rainfall. The eyewitness accounts of "disintegrating clouds" were reminiscent of weather modification controversies in Texas and Colorado, where similar observations were reported by opponents to those programs. There was no reason to believe that opponents in South Dakota had been in contact with either the Texas or Colorado opponents prior to their own opposition effort. However, subsequent to their organization, Citizens Against Cloud Seeding, made contact with the San Luis Valley opposition and the Tri-State Natural Weather Association, forming an incipient national network of opposition groups. By the 1976 legislative session, opponents had made progress with members of the state legislature, and the Program's appropriation failed to achieve the requisite two-thirds majority for passage. Thus, the Division of Weather Modification ceased to exist on June 30, 1976, after four operational seasons.

Some members of the legislature felt that cloud seeding had become institutionalized somewhat too rapidly in South Dakota without adequate evaluation of the effects of seeding on precipitation and on downwind areas such as Minnesota. The power of a grassroots organized opposition in terms of halting projects has never been more convincingly demonstrated than it is in the South Dakota case. The outcome is of particular interest since local government participated in decision making relative to the cloud seeding project and, at least theoretically, the interest groups of the community should have been represented in the decision process. However, when the economic viability of farmers is threatened through drought, and vestiges of doubt remain about the efficacy of a weather modification program, the impetus for an organized opposition is startlingly high.

CONCLUSION

The cases discussed in this article display several parallels all the more notable since they occurred independently of each other. These include the presence of dry conditions harmful to important economic interests in communities, the probable exclusion of these interests in the adoption decision process, and lack of scientific

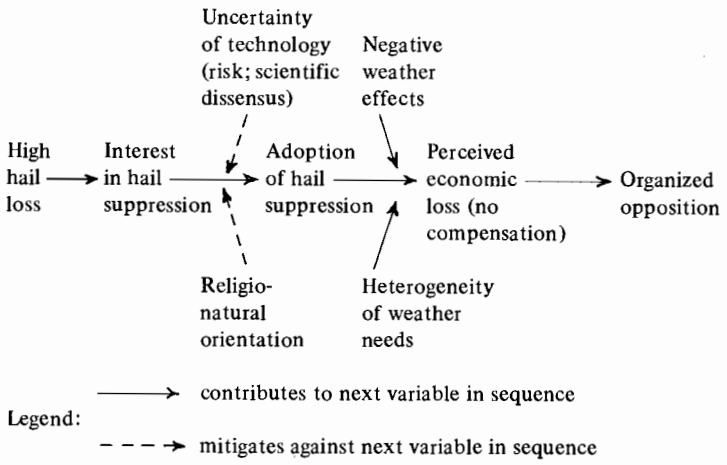

Fig. 1. Principal variables leading to organized opposition.

consensus on the operational readiness of a hail suppression technology. All cases were marked by organized opposition which led to community polarization, and the utilization of a variety of techniques to achieve ascendancy in the adversary struggle. Without exception, opponent wishes ultimately prevailed. At present, the only exception to this pattern is a hail suppression project in the Texas Panhandle continuing after five years of opposition effort.

A simplified model of the principal variables leading to organized opposition is presented in Fig. 1.

The attempt to reduce damaging hail through cloud seeding has stressful consequences of its own. The intentional intervention in potentially damaging weather processes shifts the responsibility for weather effects from being out of human control (acts of God, acts of nature) to being within human control. The boundaries of partial atmospheric control are not known, either scientifically or legally.

Application of an uncertain technology implies that a relatively unknown level of risk is experienced by recipients. If the economic effects of the weather are not beneficial during the period of application, recipients have come to feel that the risks involved are too great in comparison to the possibility of advantages that could accrue. Recipients are not limited to the sponsoring organization, but are members of the community-at-large. Adequate decision processes relative to the application of weather modification have not yet been developed.

The nation as a whole stands to benefit economically if crops and property could be protected from damaging hail. Farmers in high hail loss areas have already evidenced interest in adopting hail suppression if it could be accomplished without undesirable side effects.

But the adoption of hail suppression in its uncertain scientific status carries the potential for socially disruptive consequences, and the costs of the research and development necessary to achieve a reliable technology are high. In the end, the promise of hail suppression as an adjustment to the hail hazard is a value decision, one not easy to achieve given the complexities involved.

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A "PEOPLE'S WAR" AGAINST EARTHQUAKES

Lessons from the Chinese experience with earthquake prediction*

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Our duty is to hold ourselves responsible to the people. Every word, every act and every policy must conform to the people's interests, and if mistakes occur, they must be corrected; that is what being responsible to the people means.

Mao Tse-Tung

INTRODUCTION

Among the many unique features of China's attempt to build a qualitatively different society, the process that has commanded the most attention from Western observers is the deliberate attempt to change the nature of organizations, as well as the relations between organizations and their environment. Not only have the Chinese developed a theoretical critique of bureaucracy, but they also have put into practice their alternative to, from a Weberian standpoint, unavoidable features of bureaucratic organizations. Whyte (1973) provides a useful characterization of the similarities and differences between the Weberian and Maoist concepts of bureaucracy. While Weber stresses organizational autonomy, legal-rational authority, impersonality, unemotionality, and technical competence for task allocation, the Maoist notion emphasizes: 1) the political nature and consequences of organizational goals, decisions, and activities; 2) mass involvement with the leadership through charismatic authority relations; 3) comradeship; and 4) political as well as technical criteria for task allocation. While the Weberian model emphasizes hierarchical structure and communication patterns reflected in a differential structure of rewards and performances, as well as strict adherence to established rules and procedures, Chinese organizations stress collective leadership and consultation at all levels, a flexible approach to problem-solving, and a more egalitarian structure of performances and rewards (Whyte, 1973: 157).

A good illustration of the actual practice of the Maoist theory of organizations is provided in the Chinese approach to the problem of earthquake hazards. The problem has been defined as a matter of immediate governmental concern and its solution has been linked to

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the achievement of revolutionary goals. Grassroots involvement has been sought, and masses of people trained to participate actively in the program of earthquake prediction. Collective participation takes place within research organizations as well as through the activities of amateurs recruited among students, workers, and peasants who report their findings to relevant organizations. According to the information provided by Chinese scientists to the American Seismology Delegation (ASD), the Chinese have predicted 11 earthquakes to date (ASDR, 1975: 840) [1]. The only successful prediction of a severely damaging earthquake about which there is some concrete information was on February 4, 1975, in Liaoning Province, where a 7.3 Richter magnitude shock took place.

It is the purpose of this paper to explore some of the organizational characteristics of the Chinese effort on earthquake prediction. Given that predictions may become possible in the U.S., an understanding of the Chinese achievement has obvious theoretical and practical importance. The reader should be warned that the information available is very scarce; there are no sociological studies about the organization of the program and its social impact. No data are available about the social consequences of predictions and warnings issued in the past and, to our knowledge, there is no research about the events that took place in Liaoning Province before and after the successful prediction of February 4, 1975. Under these conditions, the information at our disposal will have to be taken at face value. Such information will be interpreted in the context provided by studies and reports about other aspects of Chinese society which furnish insights about the socioeconomic situation and the success in changing organizations and encouraging mass participation. This paper should be taken as a theoretical essay in which we have attempted to answer the following question: given what we know about the Chinese experience on earthquake prediction, what can other countries learn?

THE PEOPLE'S WAR AGAINST EARTHQUAKES

China has a large-scale program of research in earthquake prediction. It is well supported, and has a structure that includes hundreds of scientists, thousands of technicians and skilled workers, 17 basic seismic stations, 250 regional stations, and more than 5,000 observation points (ASDR, 1975: 839; CSR, 1975: 5) [2]. Perhaps the main reason China has directed considerable human and material resources into this kind of research is its long history of earthquakes, associated with great losses of human life. Earthquakes are particularly destructive in rural areas (and most of the people in China live in a rural environment), where housing has changed little since the 16th century. Lacking the economic resources to build earthquake-resistant structures, China's policy decision to foster research on earthquake prediction makes a great deal of sense. Accurate predictions, i.e. the identification of the place, time, and magnitude of earthquakes, make it possible to evacuate the population on time; relatively inexpensive reconstruction can follow. As a result of the 1966 earthquakes in Hopeh Province, whose destructive effects were inspected by Chou En-lai, the government gave high priority to the issue of earthquake prediction and, in 1971, the State Seismological Bureau was organized.

The Cultural Revolution, which began in 1966, challenged bureaucracy and its inherent elitism. Scientists and experts were put in a position of having to demonstrate their allegiance to a nonelitist educational and scientific practice. There are kinds of activities involved in earthquake prediction which lend themselves easily to the kinds of organizational requirements formulated in the course of the Cultural Revolution (ASDR, 1975: 873). A report from a delegation from Science For The People (1974) documents similar organizational

features in agriculture, industry, research institutes (e.g. genetics, chemistry, biochemistry), as well as in the areas of education, health care, mental health, and planning. The essential principle of the Cultural Revolution – that the wisdom of the people is a source of knowledge and that science should serve the people – appears as a pervasive trend throughout Chinese society. This approach to scientific practice also involves a search for scientific discoveries applicable to immediate problems rather than the pursuit of basic research which is necessary to establish a solid basis to deal with future problems. This raises questions as to the long-term benefits China may derive from its current policies which, in short run, appear to be highly successful.

Within this context, organizational response to the earthquake hazard assumes unique features which appear to further, rather than hinder, the attainment of the main organizational goal: earthquake prediction. The unique features are discussed below.

The Articulation of Scientific and Technical Activity With Specifically Stated Political Goals

The party and revolutionary committees work in conjunction with the State Seismological Bureau (SSB) and supervise earthquake studies at the provincial, regional, and county levels (ASDR, 1975: 842). According to the ASDR, the SSB appears to have jurisdiction mainly over scientific and managerial matters, and the party and revolutionary committees seem to be more concerned with personnel matters (ASDR, 1975: 878–879). The Canadian Seismological Mission, on the other hand, suggests that "... the local party committees ultimately act on or approve of any predictions, or influence the involvement of the masses," while the SSB had also jurisdiction upon personnel matters at the highest level (CSR, 1975: 5). Scientific work becomes political work, and is integrated into the philosophy of the Chinese Communist Party: "Prepare against war, prepare against natural calamities, do everything for the people" (Kisslinger, 1974). The social, political, and economic consequences of earthquakes and earthquake predictions are explicitly outlined and assessed in the context of the present stage of China's economic development. Priorities are set accordingly, and scientific efforts are directed to meet the people's needs most effectively.

The Incorporation of Amateur Workers Within the Earthquake Program

Just as China has greatly expanded its ability to cope with the health care needs of the people through the proliferation of "barefoot doctors" (i.e. paramedical personnel trained at various levels of competence), it has also expanded the potential of its earthquake program with amateurs. Besides 10,000 trained workers, including scientists, technicians and workers (ASDR, 1975: 843), there were also about 10,000 untrained volunteers working on a part-time basis in 1974, at the time of the U.S. delegation visit (ASDR, 1975: 863). The Canadian mission, which visited China a year later, found that the number of amateurs had risen to 100,000 (CSR, 1975: 5).

The policy of the Central Committee of the Chinese Communist Party in this respect is the following: "Under unified leadership of the party, take prevention first, combine professional and amateur efforts, mix modern and indigenous methods, wage a people's war" (ASDR, 1975: 879). This policy has important organizational implications:

1) It emphasizes the political nature of the scientific task of achieving earthquake prediction. Organizational autonomy is replaced by party leadership.

2) It breaks down the boundaries between the organization and the masses which are its potential beneficiaries; the organization is open and receptive to grass-roots inputs.

3) It sets the basis for breaking down the hierarchical relations that tend to characterize the relations between experts and the masses.

There are no sociological studies documenting the extent to which these policies have affected actual organizational practices in the area of earthquake prediction; the process is too recent to expect significant qualitative changes. However, it is possible to draw some conclusions, in light of the ASD report.

Scientists and expert personnel are encouraged to rely on the "broad masses of the people" who have a "rich experience of long struggle against earthquakes" (ASDR, 1975: 875). It is assumed that people who have lived for generations in earthquake-prone areas have accumulated elements of folk knowledge which are relevant as premonitory signs. The extent to which scientists give serious consideration to "indigenous" efforts is debatable at this point. In the opinion of a member of the ASD, "the main work is being done by very well trained, competent scientists and engineers whose power to make decisions seems unquestionable" (Kisslinger, 1975).

Amateur workers are taught to carry on experimentation (e.g. the analysis of water samples to detect radon flux) and daily observations, and are encouraged to communicate any anomalous observation to the nearest authorities. This policy of "mass observation, mass prevention" has important scientific and social implications. It provides the experts with an enormous amount of data which can be used in the process of understanding the preconditions of earthquakes, and increase the probability of formulating reliable criteria for sound predictions [3]. It helps build a sense of technical competence in the people that encourages their willing and active participation in the program. It educates the masses in the nature of earthquakes and earthquake prediction, as well as in the best ways of organizing and acting collectively to minimize the loss of lives from earthquakes. Finally, it creates a feeling of solidarity with the government and support for its efforts to achieve earthquake prediction with the involvement of ordinary citizens. In this context, false warnings can be accepted as a manifestation of concern rather than as a symptom of government interference and/or mistakes; the people's broad knowledge of the elements that enter into the prediction process [4] renders understandable and acceptable the possibility of failure (ASDR, 1975: 879; CSR, 1975: 41–44).

Although the skill and ability of Chinese scientists is probably comparable to those of their Western counterparts, the training of the new scientists in the context created by the Cultural Revolution has raised some doubts as to whether the quality of scientific training can be maintained. The program is also somewhat open to criticism because of the empiricism and pragmatism that characterize a great deal of the present effort; some Chinese scientists seem willing to consider any phenomena which may be related to earthquakes, no matter how uncertain their basis in known scientific principles (e.g. anomalous animal behavior). Theoretical development and use of statistical methods, laboratory experimentation, and exploration of the geophysical environment are needed to increase the effectiveness of the program (ASDR, 1975: 867). On the other hand, reliance upon extensive monitoring and analysis of premonitory effects make sense in a country like China where there are regions of frequent seismic activity, most of which can be easily reached for monitoring purposes.

American scientists are also concerned with the possible impact political objectives may have upon the program. Political pressure to predict earthquakes may result in the distortion of the claims of success. Indeed, their concern highlights a very important and practical problem: whether the training of scientists, the improvement of scientific quality, and the development of scientific leadership can be advantageously pursued in a social

context which attempts to abolish the hierarchical nature of scientific training and the isolation of science from politics.

From a practical standpoint, however, the participation of amateurs increases the efficiency of the program; it makes possible the collection and analysis [5] of a massive amount of data which would be vastly more expensive if exclusive reliance were placed upon trained experts. In judging whether the participation of amateurs is an asset or a drawback to the program, American scientists concluded that it made good scientific, economic, and political sense. It does not necessarily imply a lowering of scientific standards, but a unique articulation between the knowledge of the experts and the enthusiasm, ability, and productive potential of the people (ASDR, 1975: 879). In regard to the earthquake program, this approach seems to have important scientific and social implications. The emphasis given to mass education and collective organization to cope with eventual disasters appears to be conductive to the development of a level of community preparedness favorable to the reduction of casualties and socioeconomic disruption.

This assessment of the scientific and practical importance of the Chinese Earthquake Program can be illustrated with the events surrounding the successful prediction of a 7.3 Richter magnitude earthquake on February 4, 1975 in Liaoning Province. On the basis of the analysis of historical data about the seismic activity in the area (China has an earthquake record that goes back 3,000 years), plus the observation of anomalous ground tilts during September, 1973, and May, 1974, the SSB decided, in June, 1974, that a strong earthquake was probable in southern Liaoning Province. This led to an intensification of scientific activity, as well as to public campaigns to keep people informed. Harbor facilities in the area were reinforced, and an observation network of premonitory effects was established (Adams, 1976: 34–35; CSR, 1975: 46; *Earthquake Frontiers*, 1975) [6]. These activities involved close cooperation between experts and amateurs, whose motto was: "Rather a thousand days with no earthquake than one day with no precaution" (*Earthquake Frontiers*, 1975). There was a false alarm in December and people were evacuated for two days in spite of the cold weather (Adams, 1976: 35). After January 28, when the event seemed imminent, and a warning was given,

> ... individual communes and family brigades appear to have taken active steps to alleviate earthquake effects, including the preparation of tents and other temporary shelters for sleeping and the organization of small "working groups" to discuss the best way of helping the young, old, and disabled (Adams, 1976: 37).

New information kept accumulating and many shocks of increasing magnitude were felt during the first three days of February. On the basis of information, which included amateur observations of anomalous animal behavior and changes in the underground water, the Yingkoo Seismology Brigade at 7:00 p.m. on February 3, concluded that a strong earthquake was imminent. On February 4, at 3:50 p.m. the Haicheng seismological observatory predicted that an earthquake would occur within the next three hours (*Earthquake Frontiers*, 1975). The Provincial Revolutionary Party Committee had been warned early on February 4 by the Liaoning Seismological Bureau, and, at 10:00 a.m., had instructed the Haicheng-Yingkoo party committees to implement their emergency measures:

> ... stores were closed ... the masses on communes were ordered to construct simple outdoor shelters and leave their houses. Militiamen patrolled to enforce evacuation from houses to shelters despite the very cold weather. The news was broadcast that a major earthquake would soon occur, production teams showed films out of doors and animals were evacuated. Most of the disbelievers who returned to their homes were usually forcibly evacuated (CSR, 1975: 47–48).

The 7.3 magnitude earthquake occurred at 7:36 p.m. on February 4, about 30 km to the SSE of Haicheng; damage was extensive and

the city of Haicheng (100,000 inhabitants) was totally destroyed (Adams, 1976: 33–35; CSR, 1975: 48). While more than 1,000,000 people lived in the epicentral area, the loss of lives was extremely small. The death rate was only 3.3 per 10,000 in the most heavily damaged area (*Earthquake Frontiers*, 1975).

Agricultural activities were not seriously disrupted, and the people gave time both to reconstruction and keeping up their production targets (Adams, 1976: 37; *Peking Review*, 1975: 22). There is no information about the consequences of the earthquake in the commercial and industrial sectors. The government praised the ability to predict before the event, the cooperation between experts and the people, and the use of traditional and modern methods (*Earthquake Frontiers*, 1975; *Peking Review*, 1975).

The Chinese acknowledge that the reduction in the number of casualties is due to the fact that the earthquake took place shortly after people had been evacuated; if it had occurred after a lengthier period of time, some people might have returned to their homes (Adams, 1976: 37). In Adams' view,

> ... the achievements of the Chinese people relating to this earthquake are twofold. Technically, this is the first major earthquake anywhere in the world to have been adequately predicted.... but an even greater achievement ... is the education of the people to take part in prediction programs, and to accept the disruption to their lives that must accompany any action taken following an earthquake prediction. In this aspect perhaps lies the greatest value of involving the people in mass prediction programs (Adams, 1976: 38).

Admittedly, the little we know about what took place after (and before) the February 4 earthquake is based upon impressionistic materials, and any conclusions based upon them must be severely qualified. Nevertheless, this remarkable experience highlights the social and economic importance of the Chinese theories of science and organizations, and emphasizes the need to explore their potential relevance for dealing with earthquakes and other natural hazards in the United States.

THE CONSEQUENCES OF EARTHQUAKE PREDICTION: CHINA AND THE UNITED STATES

Given that China has had only one successful prediction of a major event [7] and the U.S. has had none, our knowledge of the socio-economic and political consequences of earthquake prediction is necessarily tentative and incomplete [8]. With respect to the U.S., the recent report from the National Academy of Sciences (NASR) on *Earthquake Prediction and Public Policy* (1975), is a rich source of reasoned speculation about the possible implications of earthquake prediction, as well as a source of research and policy recommendations for the U.S. government.

Since a similar work dealing with the Chinese experience is lacking, a comparison between the probable consequences of earthquake prediction in both countries becomes a difficult, but not impossible task. There is, after all, a great deal of information about other aspects of Chinese society, and it is possible to draw some inferences as to the probable consequences of predictions, warnings, and hazardous events in China. Here, then, is a brief discussion of those aspects of Chinese society which are likely to have a decisive influence in determining the impact of predictions. In the second part of this section, we will compare China and the United States in regard to three specific issues: warnings and predictions, the economic impact of earthquake predictions, and the problem of equity.

The Historical Context of China's Earthquake Program

The main objective of the Chinese program is to determine the location, time, and magnitude of future earthquakes. The Chinese earthquake prediction policy is to issue public warnings after pertinent organizations have reviewed and evaluated the data upon which the prediction has been based. Whenever the

magnitude of the predicted event is large, the SSB in Peking is informed before action is taken. Preventive measures involve evacuation of people from hazardous areas. This task is facilitated by the fact that, in high risk areas, the population is kept well informed about the best way of coping with earthquakes and their effects. The information includes description of precursors, ways of minimizing damage, and methods to reinforce buildings in new construction (ASDR, 1975: 863). The underlying philosophy of China's building code is that "... safety of human lives and important equipment should come first and that the building should be in repairable condition after the earthquake" (ASDR, 1975: 872). The program goal and policies as well as the building code reflect Chairman Mao's advice to the Chinese people: "Serve the people."

Reports from visiting delegations and individual scholars coincide with in-depth analyses of specific aspects of China's approach to socioeconomic development in depicting a society where ideological emphasis upon the worth of ordinary citizens and organizational changes encourage them to actively participate in decision-making processes affecting their lives. This has resulted in concrete accomplishments (e.g. building canals in areas where experts thought it would be impossible to do so; reorganizing work and achieving higher labor productivity) which reinforce the people's self-confidence and their trust in a leadership that trusts them (see, for example, Hinton, 1966, 1970; Sidel, 1974; Science For The People, 1974; Milton et al., 1974; Coye and Livingstone, 1975). Many observers have suggested that, in order to understand China's present and the allegiance of the people to the government, one must compare it to the past. In that context, the concrete achievements of the present government stand in glaring contrast with a past which is still remembered by the older generations. Such achievements have been recognized by those sympathetic to China's efforts as well as by those who are highly critical.

The Role of Ideology

Perhaps the main theme underlying Maoist philosophy is the power of the masses to accomplish goals which are defined as socially and individually desirable. "...central to the Maoist belief system is the presupposition that will, spontaneity, consciousness infused by and reflected in ideology and organization can serve as substitutes for technology, equipment, and material forces in general, at least within certain ranges" (Eckstein, 1975: 75). While the mobilization of human capital at all levels of activity (the earthquake program with its tens of thousands of amateurs is a good example) can theoretically be obtained through physical or normative coercion (if material incentives are minimized, as is the case in China at the present time), the latter option has been chosen by the current leadership. Observers indicate that planning is not rigidly implemented; on the contrary, some degree of flexibility is deliberately introduced and targets are set at such levels that they leave room for the "exercise of initiative by the masses" (Delayne, 1973; Eckstein, 1975).

Changes in Social Organization

As the changes in Chinese society have taken place very recently, drastic and widespread changes in everyone's consciousness cannot be expected. China's leadership copes with the situation through the interaction of ideology and organization in a way that emphasizes collective decision-making processes in the context of small groups where social control is exercised through peer pressure. Within urban areas, each household is embedded, through membership in small groups, into a network of block, lane, street, and neighborhood committees. The same pattern obtains

in the rural areas, where households are linked to work groups, production teams, production brigades, and communes (Eckstein, 1975: 344–346). This complex network, which is also linked to Revolutionary Party Committees, operates as a channel for the transmission of policy guidelines, ideology, and information. The totality of organizational changes conducive to the involvement of ordinary citizens in collective decision-making processes about issues directly affecting the community can be viewed as the counterpart, at the level of social organization, of the political and economic functions of ideology.

Changes in the Economic System

Theoretically, "... a socialist economic system is one in which there is public (or social) ownership for the public good of all the means of production" (Hunt and Sherman, 1975: 580). From this standpoint, China could at best be defined as a society in transition towards socialism; while land reform and nationalization of some portion of the private sector have taken place, the process of centralization and nationalization is by no means complete. What remains of the private sector operates, however, in the context of state policies that have reduced private capitalists to bureaucrats for all practical purposes.

China has a planned economy with a complex system of controls and features unique to the Chinese situation (Robinson, 1974: 47–58; Eckstein, 1975; Hunt and Sherman, 1975: 593–599). Having learned from the Soviet experience, the Chinese pursue the goal of collectivizing the economy gradually, in an attempt to avoid the economic and human costs inherent in the Soviet model of development. The Chinese process of development is characterized by a tension between two camps: those who would urge the introduction of economic incentives and the use of technological criteria of efficiency in order to increase output and further economic growth; and those who, following Chairman Mao's directives, are willing to slow down the process of growth in order to further social and behavioral changes necessary to build a social system qualitatively different from that prevailing in capitalist societies.

The Cultural Revolution was a stage in the struggle between those two approaches which ended with the success of the Maoist standpoint. Monetary incentives have lost primacy and moral incentives are emphasized throughout the system; increases in work productivity at the individual and group level are viewed as expressions of self-respect, public spirit, and as a proof of revolutionary zeal. This involves "putting politics in command" in the context of production, distribution, and consumption; "putting profits in command" is rejected and regarded as "taking the capitalist road" (Robinson, 1974: 47–48). Under these conditions, the social and economic consequences of predictions, warnings, and hazardous events, and disaster preparedness planning and hazard reduction measures, will most likely be different from those which can be expected in American society, which rests upon class and socioeconomic status differences and fosters competition and individualism at all levels of the social organization.

China and the United States: A Comparison

Warnings and Predictions

Available studies of individual and organization response to disaster warnings in the West suggest that earthquake prediction may encounter a rather problematic reception. At the individual level of analysis, it seems that the spontaneous tendency of many people is to deny the danger and to be over-optimistic about the situation. At the organizational level, those in charge of issuing warning are generally reluctant to do so; their desire to avoid giving a false warning may sometimes

lead them to wait until it is too late (NASR, 1975:48). A false warning may affect their credibility and public effectiveness, or may render them legally responsible for property damages that may result from the social and economic impact of the warning. In this respect, Haas (quoted in the NASR, 1975:51) suggests that not only the credibility of the officials will be endangered, but also the credibility of the forecast itself. From the standpoint of the differential response associated with the position of groups in the social structure, those who are placed "outside the mainstream" of society (i.e. the elderly, the handicapped, the lower socioeconomic status groups, and members of minority groups) may be less likely to respond adequately to the warning. They may not receive it or, because of lack of education or knowledge of the English language, may not understand it. Furthermore, they may not give it credit because of their lack of trust and grievances towards the public authorities (NASR, 1975: 47–52). Finally, warnings and predictions may be questioned and attacked by those groups whose social, political and economic interests may be negatively affected by them (NASR, 1975: 57).

Reactions to warnings and predictions are likely to be different in China; the available information suggests that they are favorably received and respected by the population. This response is partly the result of the intense educational campaigns, the practical involvement of the people in the program, and the relationship of trust developed between laymen and experts, the people and the government (Adams, 1976; *Earthquake Frontiers*, 1975; *Peking Review*, 1975). Within the seismically active areas, the Chinese appear to have developed, through organizational action, a level of "disaster culture" (i.e. familiarity with the hazard and its consequences, as well as readiness to cope with them efficiently) which may have been strengthened by repeated exposure to predictions and warnings. The Chinese have not hesitated in issuing warnings and evacuating people even though the prediction technology is still in preliminary stages of development.

Amateur and local political participation in the prediction process, as well as the current Chinese political structure, are considered, by Canadian scientists, the reason why "... the people involved appear to accept the enormous self-discipline involved in wholesale evacuation, (even at −20°C) and indeed may well have stayed in primitive field conditions for up to 2 weeks on the occasion of some false alarms" (CSR, 1975:41) [9]. Given that the government has been able to fulfill its promises in the subsistence and health care areas, it would seem safe to assume that the credibility of public officials is relatively high.

Also, the involvement of ordinary citizens may have produced "... an awareness among the people that this is *their* programme, and that failures or false alarms are the responsibility of the people themselves, as well as of the scientific experts (Adams, 1976: 33). Collective responsibility for failure seems to be linked to collective responsibility for success: "... when a successful prediction occurs, such as the Haicheng event of Feb., 1975 ... *no one official or scientist or group of these at either the central, provincial or local level claimed this as an individual triumph*" (CRS, 1975: 41; emphasis added)."

However, not everyone believed the warnings issued prior to the February 4 earthquake. There is no way to ascertain the extent to which those who died did so because they did not believe in the warnings. What public officials would like the people to believe is, however, very clear, and a fable has developed which will probably be used in future educational campaigns dealing with earthquake prediction:

> Most people moved outside when warned of the earthquake, but a few old, stubborn men said "What earthquakes? We don't have earthquakes here!" and did not believe that the party and the state could predict earthquakes. They stayed inside, and were killed (Adams, 1976:37).

Within the Chinese economy, the role of private property has been changed, and the issue of responsibility is likely to be conceptualized in political, rather than legal terms: what is at stake is the political purity and dedication of the masses and the experts rather than the protection of individual property rights. Chinese scientists and officials may fear political reprisals, although they have been willing to issue warnings and evacuate people very early in the program; this suggests that the situation may be different, at least as long as the program is in its early stages. As stated before, we lack data in this respect.

Changes in social organization and income distribution would suggest that in China, no one is placed "outside the mainstream of society" either socially or economically. It would seem reasonable to assume that the complex organizational network surrounding households would maximize their exposure to warnings as well as the likelihood of adequate response. Although no data are available, it can be conjectured that a probable result of the interaction of ideology and organizational change in the area of natural hazards may be that of increasing the likelihood of collective responses to warnings favorable to saving lives and maintaining some degree of social order.

Economic Consequences of Earthquake Prediction

It should be clear that predictions will always have economic effects (besides social and political) which may vary according to the particular structure of productive activities characterizing the area affected by it. Economic effects will also vary depending on length of lead time; problems arising from predictions with short or long lead times will be very different. In our view, such economic implications cannot be properly conceptualized without including in the analysis the specific features of the socioeconomic system where such predictions are made public. The determinants of investments, the levels of employment, the role of the state, and the pattern of income distribution differ from one system to the other, and will most likely structure the economic impact of predictions in different ways. Because of the limitations of this work and the lack of data on China's past prediction experience, we can give only perfunctory treatment to a topic that deserves a much more detailed investigation.

The U.S. economy is a capitalist economy, i.e. an economy characterized by the private ownership of capital in which the prime motivation for investment is the expectation of future profit (Hunt and Sherman, 1975). Consequently, an earthquake prediction is likely to have a negative effect upon the "propensity to invest" in some sectors of the economic structure: "The severe local economic depression produced by the earthquake prediction may represent economic loss as great as that produced by the earthquake itself" (Haas and Mileti, 1976: 18). Consequently, a key concern and responsibility of public officials in assessing the probable effects of issuing an earthquake prediction is the possibility of generating an economic breakdown in the threatened area. According to the National Academy of Science Report, "... some economic relocation, some economic losses, and some economic disruption are inevitable" (NASR, 1975: 70), and public assistance will be required to mitigate the consequences of the economic downturn in the area. Somewhat similar effects are likely to follow from prediction failures, to which political problems and loss of credibility in predicting may be added. Although the economic decline will affect the public sector through loss of revenues, some public services and public utilities will have to be maintained. Some form of outside aid may be necessary, thus increasing the complexity of the problem (NASR, 1975: 70–77).

Some of the possible manifestations of economic disruptions in the United States are the following.

Private Sector: 1) Chaos in the real estate and security markets because of panic selling; 2) decline in investments; 3) possible flight of capital; 4) downward multiplier effects in income and employment; 5) changes in credit and lending policies; 6) changes in insurance policies; and 7) speculation resulting in panic selling of homes or purchase of expensive and unnecessary building improvements.

Public Sector: Both the government and public utilities will face similar problems: a loss of revenues and ability to borrow at a time where public services and utilities should be maintained. An additional burden to the government will arise from the need to expand certain services (e.g. fire protection, emergency agencies) (NASR, 1975: 72–77).

Needless to say, what goes on in the private sector affects the public sector and vice versa, and the different effects within each category interact.

Although incomplete, the possible consequences listed above provide a base for speculating about possible consequences in China. Assuming a credible prediction with a long (e.g. three years) lead time, and in light of what we know about China's economic and social organization, it is likely that whatever economic measures may be taken are not going to result in widespread unemployment and/or economic insecurity. Such a conclusion follows from the qualitative differences between the U.S. and the Chinese economies as we understand them, and from the ideological, organizational, and political features currently dominant in China.

Ideologically, earthquakes have already been defined as targets for the people's collective struggle. A credible prediction would provide a rallying point for intensifying professional and amateur efforts, and increasing the scope of educational campaigns. This would create a favorable social context for the implementation of political and economic measures designed to minimize the loss of lives and economic losses.

Although it allows a varying degree of flexibility and relative autonomy at the local levels, the Chinese economy is highly centralized. It is reasonable to assume that, while encouraging self-reliance at the local level to cope with the impending disaster, the leadership will impose severe limitations on the private sector. Sudden declines in investments and/or flight of capital, real estate and other kinds of speculation, and changes in credit policies detrimental to the economy are not likely to be tolerated. Income and employment levels are likely to be maintained while alternative possibilities are explored by local, regional, and central authorities. Once a plan of action has been decided on, its implementation is likely to coordinate changes in the allocation of capital and labor such that the employment of the population and its levels of subsistence do not suffer drastic changes.

Such conclusions do not stem from "faith" in the Chinese system; they follow from the differences between a capitalist and a socialist economy. The essential characteristic of the capitalist economy is "... the absence in the market automatism of a 'built in' mechanism keeping aggregate effective demand on a level requisite for the maintenance of full employment ... (hence) the state has to assume responsibility, when unemployment develops, for measures calculated to raise aggregate effective demand to a level compatible with full utilization of human resources" (Baran, 1969: 118–119). If, in "normal" times, unemployment and state intervention (e.g. through military spending, welfare payments, foreign aid) characterize the U.S. economy, an earthquake prediction is likely to exacerbate the situation, increasing pressure on the public sector to cope with the ensuing situation.

Theoretically, in a socialist economy the distinction between the public and the private sector disappears with the collectivization of capital. The economy is committed to full employment and, therefore, there is no conflict between the pursuit of economic effi-

ciency and the welfare of the working population. At this stage of China's socioeconomic development, it would not be accurate to describe it in those terms; although highly centralized, the collectivization process is by no means finished. Consequently, some sectors of the population may support the present system while others oppose it. An earthquake prediction is likely to trigger among the dissenting economic sectors reactions similar to those described as probable within the U.S. However, since the interests of private property must be subordinated to the interests of the people represented by the state, it is likely that the government may curb those interests through coercive measures in order to implement its economic policies and ensure the livelihood of the population. Under these conditions, it is probable that economic panic may be short-lived and economic disruptions avoided (if by such we understand drastic changes resulting in widespread unemployment, speculation, uneven distribution of the financial burdens required for hazard reduction measures).

Finally, it seems reasonable to suggest that Chinese prediction failures might be taken in good faith without creating political and economic problems. This type of response would be ensured by the practice of collective responsibility and "criticism and self-criticism" so prevalent at all levels of Chinese society, as well as by the organizational uniqueness of the earthquake program. There are no data on actual consequences of prediction failures, and it is not known how many failures are likely to be tolerated.

Equity

The problem of equity takes on different meanings according to the context in which it arises. It would seem logical to assume that the economic costs following a Chinese earthquake, or the expenses associated with the issuing of a prediction, would be collectively met without any specific sector of the population assuming an unfair share of the burden.

In the context of the U.S. economy, the problem of equity becomes acute. The very issuing of a prediction "... will change the basis on which various groups in the community calculate their own interests" and, therefore, "[it] will affect the wealth and welfare of the population unequally" (NASR, 1975: 96–97). All those sectors of the community which stand to experience economic losses will probably take measures to protect their interests; the impact upon the welfare of the population as a whole will depend upon the kind of economic rights those measures are designed to protect. Homeowners' decisions will not have such a profound impact as those of the sector that provides employment and controls the livelihood of the majority of the population. The impact of the economic disruption will spread throughout all levels of the socioeconomic structure, affecting not only wage earners but also the poor, the handicapped, ethnic minorities, big and small businesses, and the public sector. Although every sector will suffer, their unequal wealth and power will unavoidably be reflected in their unequal share of the costs. An illustration of this point is provided by past experience with postdisaster relief which indicates that "... low income groups may benefit little from public programs for mitigating earthquake hazards: over 75 percent of the recipients of Small Business Administration disaster loans following the San Fernando earthquake of 1971 had incomes over $ 12,500" (NASR, 1975: 104).

LESSONS FROM THE CHINESE EXPERIENCE

The extent to which the Chinese experience could be taken as a model for the United States is a matter that deserves careful consideration. A first approach to the question of its transferability might tend to emphasize the obvious fundamental differences between the two

societies and the apparent impossibility of transferring any organizational patterns from one to the other [10]. It could also be argued that we actually have no data about the actual consequences of predictions, warnings, and earthquakes in China. Furthermore, given that earthquake prediction is still at a preliminary stage, any attempt to draw "lessons" could be viewed as a superfluous exercise.

Nevertheless, the little we know is interesting and compelling enough to justify the attempt to explore its possible relevance for the U.S. Broadly speaking, the Chinese experience can be viewed as a challenge to our deeply ingrained beliefs about "human nature" and "the way things are." It forces both scientists and policy makers to specify and evaluate the structural constraints that may stand in the way of the use of earthquake prediction as a means of ensuring social welfare, rather than as a means for increasing existing socioeconomic inequalities. That a danger exists in that direction is recognized by the authors of the report on *Earthquake Prediction and Public Policy*:

> The opportunity to devise means for saving life and property through constructive long- and short-term actions and the necessity for coping with potentially counterproductive responses to earthquake predictions constitute the social challenge of earthquake prediction (NASR, 1975: 24).

White and Haas have expressed similar concerns, and argued that high priority should be given to empirical research on the social, political, economic, and legal consequences of earthquake predictions and warnings (White and Haas, 1975: 331). It is perhaps from the Chinese experience that American policy makers and social scientists may learn ways to cope with at least some counterproductive consequences.

Scientific research on earthquake prediction is not only well under way in the U.S., but is developed on a technological level that renders superfluous the participation of amateur seismologists. Consequently, if a U.S. program of amateur involvement were created, it would most likely be focused upon the social, economic, and political dimensions of the prediction issue. For the purposes of developing the argument, we shall assume that such a program will be created and will provide some tentative answers to those questions. Sociologically, it can be hypothesized that the participation of ordinary citizens could have important consequences at both the program and community levels.

Citizens' Participation at the Program Level

While the U.S. technological level seems to rule out the participation of amateur seismologists, ordinary citizens could have an important input in the program as "amateur sociologists." It has been suggested that the level of potential disruptions resulting from credible predictions may be reduced if:

> ... in advance of credible forecasts for damaging earthquakes, responsible public agencies and *private interest* groups develop plans and policies which are based on *realistic assumptions about the actions of other organizations and people .... If the results of careful research on the probable responses of organizations and the public* are reported to all responsible officials, *they* will have adequate, realistic knowledge upon which to develop *their* plans (White and Haas, 1975: 331–332; emphasis added).

Research of the kind suggested above could be carried out in a variety of ways; each of them could meet the goal of providing a sound basis for planning, while having drastically different impacts for the various sectors of the community affected by those plans. Some of the key questions emerging in this context are the following: 1) which interest groups would be taken into account?; 2) how would the interests of the most vulnerable and non-organized sectors of the community be considered?; 3) which officials would do the planning; public officials only, or public officials and representatives of those interest groups?; 4) if public agencies and private interest groups plan separately on the basis of research findings which they share or have

contracted on their own, how is it possible to guarantee the harmony among the consequences of those plans?; and 5) whose plan would it be? – whose interests would be contemplated?

The Chinese experience suggests that a participative democratic interpretation and implementation of a pre-prediction research project on the potential socioeconomic impact of earthquake prediction would be more conducive to social welfare than a bureaucratic and paternalistic approach. An active role should be given to those who are the object of the research, especially the less privileged sectors. Theoretical perspectives tend to reflect the viewpoint of the dominant groups in the society and, in downgrading the knowledge that could be obtained from the less privileged sectors' interpretation of their world, social scientists may overlook some of the key points of stress, as well as some of the most positive aspects of the existing social arrangements. It would be to the advantage of public officials and public agencies genuinely committed to the interests of all sectors of the community to take seriously ordinary citizens' assessments of their situations.

Research findings of the kind suggested above will unavoidably reflect the existing balance of power between classes and interest groups; levels of income and employment; levels of perceived consensus and conflict; and, broadly stated, the structural constraints and opportunities characterizing the threatened area at the time. It may be that leaving the status quo unchanged may guarantee the predictability of organizational and public responses; however, such responses may necessitate a greater use of social control measures and a greater level of public spending than what would be necessary if a greater degree of cooperation among different sectors and collective involvement were rendered possible. For example, responses suggesting the possibility of serious social disturbances may be linked to a series of factors amenable to change through the intervention of relevant public agencies, e.g. discriminatory hiring practices affecting minorities and women and landlords' lack of compliance with the law in the most deprived areas.

While social scientists could find such information without involving the people directly affected, there may be advantages to soliciting their input actively.

Social scientists should be concerned with discovering, through their research, not only what organizations and individuals would be likely to do in case a credible prediction becomes possible, but also the structural constraints that make those responses possible. Research findings may thus provide data to assess the existing positive and negative features of the current socioeconomic system and its ability to cope constructively with earthquake prediction. Also, such data should enable scientists and policy makers to evaluate the wisdom of allowing earthquake prediction to become a commodity from which groups may benefit or not, depending upon their command of resources in the market. Individuals placed in different *class situations* have different chances for "... a supply of goods, *external living conditions*, and *personal life experiences*, insofar as this chance is determined by the amount and kind of power, or lack of such, to dispose of goods or skills for the sake of income in a given economic order" (Gerth and Mills, 1958: 181; emphasis added). Besides the usual units of analysis found in the current literature (individuals, families, communities, and organizations), additional research should incorporate those units of analysis which actually determine an individual's life chances: class structures defined in terms of the ownership or lack of ownership of productive property. This is of extreme importance in determining the structural limitations within which planning and policy making can proceed before and after a prediction. To the extent that the implications of power differentials linked to class differences

remain outside the scrutiny of those concerned with the safety of the community, they will impose limitations to the implementation of hazard reduction measures.

The encouragement of ordinary citizens to voice their concerns to social scientists and/or public officials could help social scientists and officials refine their understanding of the situation. It may be that, through input from the "broad masses of the American people," small and feasible changes may be undertaken which would greatly enhance the possibility of mobilizing public support for community preparedness and hazard reduction measures.

Citizens' Participation at the Community Level

Conditions conducive to adequate public responses to earthquake predictions may also be enhanced by a program of mass education in seismic areas. A prediction with a long lead time may allow for the organization of a long-term educational campaign within and outside the educational system in which teachers as well as volunteers from community organizations may participate. For example, a series of multimedia presentations addressed to different sectors of the community could be devised as part of an outreach program to educate and mobilize citizen support. Emphasis would be given to eliciting feedback from the audience in order to learn from them; there may be positive or negative features in their situation which might be easily overlooked. An effort could be made to reach them a second time to let them know whether their criticisms and suggestions have been taken into account, and what alternatives are open within the existing constraints. This is all very general, of course, but the Chinese experience suggests that public support of the kind needed to cope successfully with these issues is more likely to be obtained through active citizen participation and concrete demonstration of concern for citizen plight, than through the imposition of measures from above with the help of law enforcement agencies.

Once a warning has been issued, public officials are faced with three main tasks: 1) "preparation for postdisaster emergency response and recovery; 2) devising and implementing hazard-reduction plans; and 3) coping with potentially counterproductive responses to prediction" (NASR, 1975: 109–110). Public support and participation may be more readily forthcoming for the first task, while the other two are likely to encounter some resistance and could be more "politically hazardous" for public officials (NASR, 1975: 110).

The area of health care is one in which collective participation may be encouraged to increase the ability of the community to cope with postdisaster emergencies: "... training in emergency skills such as first aid could be organized on a massive scale in the months just before the predicted event" (NASR, 1975: 109–110). China provides a striking example of the advantages involved in the large-scale training of paramedical personnel, and its gains in the area of public health are partly due to its hundreds of thousands of "barefoot doctors" (Coye and Livingstone, 1975: 409–413). A similar approach may be taken in the U.S. to insure that no sector of the community is left defenseless. Public support for the other two tasks mentioned above may be obtained through the activity of already existing voluntary groups which "... can be utilized to help in posting safe and unsafe facilities, to devise community plans for the actions to be taken as the time of the predicted quake approaches, to inform public officials about individuals who may suffer because of hazard reduction measures, and to encourage community cooperation" (NASR, 1975: 110).

The achievement of organizational changes implied by the two types of citizen participation previously described would require an extraordinary degree of commitment on the part of scientists, public officials, and "leading

citizens." That commitment should be manifested in concrete efforts to remove some existing social conflicts in the community if public support is to be mobilized effectively. The success of Chinese leaders in activating "people's wars" against earthquakes, pests, disease, or low productivity rests not only upon ideological indoctrination and social control through peer group pressure, but also on the basis of concrete achievements from which Chinese citizens actually benefited.

It may be argued that, given the superior technology of American society, there is no need to mobilize human capital as the Chinese have done. However, exclusive reliance on technology may be fatal in case of an actual disaster. Furthermore, the "people's wars" are more than mobilizations of human capital; sociologically, it could be argued that their latent function is the creation of social solidarity and collective support which are invaluable in cases of mass emergencies. Regardless of the extra time and resources involved in creating conditions favorable to widespread collective involvement, it would seem that communities could not but benefit from waging their own "people's war" against earthquakes.

THE ISSUE OF EQUITY

It is important to notice that, besides positing organizational alternatives such as those discussed above, the potential of China's socioeconomic system to neutralize the disruptive economic effects of earthquake prediction raises an important question: To what extent would it be possible to take earthquake prediction (and those aspects of community preparedness which local governments do not take care of) out of the market context and treat it as an objectively defined social good from which everyone – regardless of position in the social structure – should benefit?

As was previously pointed out, different classes have different chances in the market and to leave to the operation of the market something which could be enormously disruptive is, to say the least, questionable. The issue of equity requires careful consideration because "... the publication of an earthquake prediction will affect the wealth and welfare of the population unequally" and "... the very steps taken by government and public agencies to mitigate earthquake hazards will have costs that could easily fall unfairly on some segments of the community" (NASR, 1975: 96). For example, mandatory earthquake insurance and expenses necessitated by earthquake-related building improvements specified by new building codes would greatly increase the cost of housing. Given that housing is already expensive and large sectors of the lower income population have already been constrained to live in mobile homes where they become highly vulnerable to nature hazards, such measures would push even more people out of the market for adequate housing (NASR, 1975: 103). To suggest that the government may provide such building improvements at a nominal cost for low income homeowners runs against deeply held beliefs as to how the American system should function. On the other hand, without some governmental action, stricter building regulations and mandatory insurance in threatened areas may contribute to an increase in existing inequalities in the housing situation. The issue becomes further complicated if the situation of low-income and welfare recipients renting substandard housing is considered.

Although the authors of the report on *Earthquake Prediction and Public Policy* encourage the exploration of alternatives to the present methods of adjusting to natural hazards, they are nevertheless doubtful in their assessment of the possibilities of coping effectively with the issue of equity:

> It is *doubtful* that any set of rules can be devised to ensure that the politically and economically weak are not the innocent victims of programs to lessen destruction and injury from a predicted earthquake. *It may be essential to*

> *assign responsibility to some public agency to serve as watchdog in this regard*. As plans are developed in response to a prediction, they should be *monitored by the watchdog agency* for inequitable features that might then be corrected before the plans are actually implemented (NASR, 1975: 104; emphasis added).

In this regard, China's experience suggests some alternatives. A public watchdog agency may be insufficient and perhaps counterproductive to the extent that, following Western criteria, it may be formed by experts of one kind or another and be isolated from the people which it aims to serve. An agency of this kind might gain effectiveness to the extent it incorporates citizens' input representing the most vulnerable sectors of the community. Plans might be more effectively monitored with the participation of all those whose lives will be directly affected by them.

The measures taken will most likely be insufficient to ensure the welfare of the politically and economically weak as long as they remain subject to the forces of the market. That the market is likely to have the final say in the issue follows from the first recommendation of the NASR:

> The highest priority in responding to earthquake prediction should be assigned to saving lives, with secondary attention to minimizing social and economic disruption and property loss, *provided the costs of specific measures are within the limits that society is willing to accept* (NASR, 1975: 3; emphasis added).

The abstract and misleading notion of "society" obscures a fact that policy makers, public officials, and citizens already know: the limits will most likely reflect not the decision of an abstract entity called society, but rather the concessions public officials and public pressure might be able to exact from the dominant economic interests in the area.

It may be argued that some levels of government spending to reduce inequalities may be possible if, like other types of government spending (e.g. military spending, foreign aid, public works), they raise the level of aggregate demand and create a favorable climate for investments. There are, however, inherent limitations to what the government may accomplish in this regard because it cannot compete with private enterprise (Baran, 1969: 116–126). Perhaps the main policy available is that of increasing the level of disposable income of individuals through tax reforms and low interest loans, but such policies might not deal effectively with the needs of the most vulnerable sectors (i.e. unemployed and underemployed, retired, welfare recipients).

CONCLUSION

Theoretically, some conclusions relevant for developing the comparative analysis of adjustments to natural hazards can be derived from the previous discussion. The analysis of responses to predictions, warnings, and actual disasters comparing socialist and capitalist societies should focus not only upon variables common to both types of society (e.g. technical and social division of labor, organizational complexity), but also upon those features which define them as qualitatively different modes of social organization – the systems of production and distribution. An admittedly tentative comparison between the possible consequences of earthquake prediction in China and the U.S. suggests that their respective systems of production and distribution, operating through their dominant forms of social organization, income distribution patterns, levels of employment, and access of individuals to nonmarket goods, are likely to have an enormous impact in structuring the possible social and economic consequences of predictions. It is beyond the scope of this paper to further develop this theoretical point. We want to stress the need for pursuing that line of theoretical inquiry, however, because, to the extent that such differences are overlooked under the guise of a general theory of "industrial society," the results are likely to be highly misleading [11].

With respect to organization theory, the Chinese experience with earthquake prediction,

as well as with other areas of socioeconomic activity, suggests that more theoretical and empirical consideration should be given to the Maoist theory of organization. To cling to the Weberian model as the only efficient form of bureaucratic organization may be as misguided as suggesting that the Maoist model has completely replaced it (Whyte, 1973: 162–163). Both types of organizational structures may achieve high levels of efficiency within different social contexts. Given the qualitative differences between their respective latent functions (i.e. the Maoist model may increase social solidarity and collective involvement, while the Weberian model increases social distance and individuals' mistrust of the experts), it would seem of great theoretical and practical significance, in the context of adjustment to natural hazards, to investigate the conditions that would make possible the functioning of the Maoist model with a maximum of efficiency.

From the standpoint of policy making, the most important lesson from China's experience is that, when citizens at large are allowed to voice their concerns and actively participate in social processes which affect their own welfare, the gains in efficacy as well as in social welfare are likely to be considerable. This posits a challenge to scientists and public officials. Social research can limit itself to describing the status quo and developing possible modes of adaptation to it or, instead, uncover those features that stand in the way of maximizing policy effectiveness and social welfare in relation to natural hazards, and suggest constructive ways of overcoming them. Protection against natural disasters can be left to the contested struggle among classes, as it is reflected in the forces of the market and agencies that deliver services to the underprivileged, or the American people can also wage a war against earthquakes and other natural hazards in close cooperation with experts and public officials. The resolution of these issues depends, ultimately, upon the commitment of scientists and policy makers to consider the interest of ordinary citizens first.

Such a statement may seem naïve and utopian. On the contrary, the notion that the potentially negative consequences of earthquake prediction, as well as the consequences of earthquakes and other natural hazards, may be reduced through greater public concern with social equity, through an increase in collective involvement, and through the development of social solidarity is sociologically more sound than the assumption that such results could be achieved in a context of unrestricted competition among very unequal contenders.

NOTES

1 The American Seismology Delegation visited China from October 5 to November 5, 1974 and, throughout the text, their report will be referred to as ASDR.

2 The Canadian Seismological Mission visited China from October 20 to November 10, 1975 and, throughout the text, their report will be referred to as CSR.

3 There are some problems at the present time. Since amateurs decide when they are confronted with an anomaly, it becomes difficult to evaluate the results; however, the potential of this program for generating a vast data base is excellent (Kisslinger, 1975).

4 While this may appear to be an overstatement, it must be realized that, among the amateurs' tasks, that of mass education is of key importance (ASDR, 1975; CSR, 1975; *Earthquake Frontiers*, 1975).

5 Analysis is carried out by amateurs – who decide which observations are anomalous – and experts to whom those observations are reported. Needless to say, the area of amateurs' decision making introduces an element of uncertainty in the program with which Chinese scientists will eventually have to deal to improve the quality of their data.

6 Besides the article from *Earthquake Frontiers* listed in the references, the author has also consulted another article from the same journal: "Success of Earthquake Prediction in China" (translated into English by Kazuo Oiko from the Japanese translation published in the journal *Kagaku*; no further information given).

7 On May 29, 1976 a major earthquake occurred in Yunnan Province in southwest China. While first reports indicate that this earthquake also was predicted, no specific information is available at this writing.

8 Empirical research is currently under way on this subject: J. Eugene Haas and Dennis S. Mileti, "Socioeconomic and Political Consequences of Earthquake Prediction" (NSF

Grant #AEN 74-24079). Their research covers the actual consequences of earthquake predictions in Kawasaki, Japan (1974–75) and Wilmington, North Carolina (January, 1976) as well as estimates by organizational executives and families as to what their responses are likely to be to prediction of a damaging earthquake in California.

9 These are observations made by the scientists of the American and Canadian Seismology Missions; there are no sociological studies about the actual consequences of failures and predictions in China.

10 In this respect, Canadian scientists state that "The life-style in urban areas in Canada, the socio-economic situation and the freedom of communication is such that no member of the Canadian mission can envisage any realistic or acceptable adaptation of the Chinese style of earthquake precautionary measures to Canada even were earthquake prediction possible at this time" (CSR, 1975: 54).

11 To quote Giddens (1976), who argues that the theory of industrial society should be abandoned or at least scrutinized, given that its assumptions have become obsolete, "We should take seriously and explore the possibilities inherent in the idea that there are differing "paths" of development among the industrialized countries which *cannot* be squeezed between the confines of the old theory of industrial society" (Giddens, 1976: 721).

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