

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
							549

^aKenneth 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.

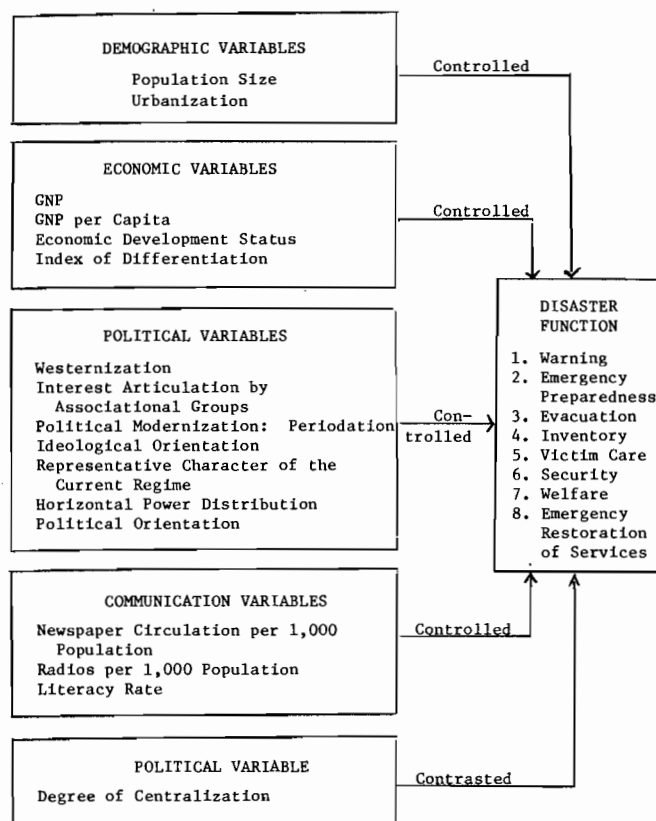


Fig. 1. The independent and dependent variables

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	O=Response 1 First Disaster 2 Second Disaster 3 Third Disaster

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).

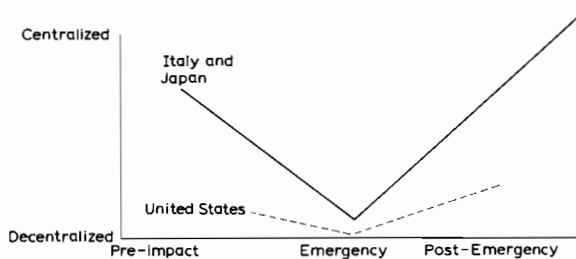


Fig. 2. Patterns of response by stage of disaster

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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