# CHAPTER 2

# CHIEF CHARACTERISTICS OF DISASTER


## Summary

*Disaster refers to a relatively sudden and violent disruption of the social system of a community, caused by some external agent or event over which those involved have little or no control. It is a special kind of emergency situation, focused on the community level. All emergencies, individual and social, may be viewed as resulting from a sudden shift in energy input or distribution which requires emergency action to handle. A disaster involves a double-negative shift: the destructive event creates a multitude of small and large emergencies and at the same time destroys and disrupts the community's emergency resources of personnel and facilities. There are ten ways in which a disaster event disrupts behavior and the social system: Death of persons nearby, destruction of homes and property, destruction of essentials like food, loss and disorganization of emergency services, destruction of transport facilities, breakdown of communications, threat and fear, emotional shock, sense of urgency, and the suddenness of the changes. The geographical space involved in a disaster is divided into five zones: total impact area, fringe impact area, filter area, organized community aid area, and organized regional aid area. The time encompassed by a disaster is classified in five main phases: pre-disaster, warning, impact, emergency, and recovery. Individual and social effects and reactions are largely a function of where people are in disaster space and when they are observed in disaster time. A nuclear emergency would produce special problems because of its destructive power, radioactive contamination and fallout, and the fear which these two would arouse. Thus responses to warning may be exaggerated and difficult to control, shock and disaster fatigue may be confused with symptoms of radiation sickness, helpers would probably not converge on the impact area but avoid it, survivors may have to live in shelters because of the danger from radioactive fallout, and the extent of the destruction and casualties would produce more profound and lasting disruption of community life.*

## Definition of Disaster

The word disaster is commonly used to refer to a relatively sudden and violent disturbance in the life of one or more persons, caused by some agent or event over which those involved have little or no control. The disturbance may involve personal injury, injury or death of loved ones, a drastic and unhappy change in one's circumstances and way of life, or loss of support, job, or property. Whatever the cause and the particular affliction, there is always the common element of extreme disturbance and disruption in the survivors.

Most authorities in the area of disaster research consider the above definition too broad—it would include emergency situations like automobile accidents, suddenly losing one's husband and sole means of support, and so on. In order to focus its meaning on social situations, the term is now reserved for *widespread disruptive effects on the social system* and life of community or of a large part of a community—a community being defined as a collection of people who occupy a common geographical area and who are bound together in relatively permanent and interdependent service and social relationships. In this definition, the focus is not on the disturbance and disruption in the lives of individual persons, but on disruption of the social system which normally functions to supply the needs, to order the relationships, and to handle the ordinary emergencies of people in that community. Moreover, the disaster agent is understood to be an external event over which the people involved have little or no immediate control, such as windstorms, floods, fires, explosions, food or air poisoning, and epidemics of disease.

Like most definitions of complex behaviour and social phenomena this definition has some limitations. It would exclude such important catastrophies as the 1964 football stadium panic in Peru (Blank, 1965) in which between 287 and 328 persons died—the number exact has never been ascertained. It was a major calamity in terms of its impact on thousands of people. However, it was not caused by a large external event; the crowd of 53,000 spectators did not constitute a community in the accepted meaning of the word; and there was relatively little disruption of the general social system following the event. A rather simple chain of events, starting with a disallowed goal and ending with the police lobbing tear gas into the crowd, started a panic-stricken exodus in which hundreds were trampled, killed and injured. It is one of a few instances in which mass panic was clearly the cause of a major calamity. However, although such an event may provide valuable information about human behaviour in an emergency situation, it is more properly classified as a crowd phenomenon rather than a disaster (Westley, 1956).

The 1945 V.E. day riot in Halifax is another example which has some but not all of the features of a disaster. There were at least 2 deaths, hundreds of injuries, an estimated $2,000,000 worth of damage, and the social system in a large section of the community was severely disrupted for many hours. However, no destructive external event triggered the riot or produced the damage and disruption. It was essentially a crowd-produced phenomenon.

Another case which came close to being a disaster was that of the Port Jervis, New York, flood. A large section of the city had been flooded by the rains which Hurricane Diane dumped on the area in August, 1955. This emergency had been handled relatively well by the city's population of 9,000. However, just when the water had practically receded from the streets two days later, a false report or rumour was spread shortly after midnight that the huge dam above the city had broken. Within an hour about one-quarter of the inhabitants had fled, with much confusion and disorganization. Indeed, this sudden mass exodus came close to being a calamity in itself. However, though it occurred within the context of destruction by an external agent, the near panic-stricken flight of a proportion of the community was precipitated by a rumour and not the hurricane as such. Had the exodus caused injuries, loss of life, and destruction, this would have to be attributed to the behaviour of the people involved.

The above three examples represent emergencies in which *threat, frustation* and *rumour* were the precipitating causes, and not some destructive external agent. They were crowd phenomena involving the rapid

spread of fear, excitement and anger, and loss of social responsibility. They were situation in which large numbers of people received wrong information and were mismanaged by the authorities. The net results were assuredly emergencies of extreme proportions, but they were essentially crowd-produced, and Westley's (1956) monograph deals with such phenomena in detail.

Another situation which borders on being a disaster is when mass unemployment suddenly strikes a community. After the 1958 disaster in Springhill, Nova Scotia, which took the lives of 75 miners, the last mine was closed and sealed. Over night nearly 1,000 man were deprived of their jobs and only means of livelihood. In many respects this resulted in a more serious emergency for about 1,000 families than had the deaths and destruction in the mine. However, the emergency was largely an individual and family affair, and did not seriously disrupt the social system. Moreover, the impact of being jobless was gradual because disaster-fund assistance and unemployment insurance cushioned the financial loss for some time. Nevertheless, this instance represents a kind of emergency which affects a great many individuals and families in our society from time to time.

## Disaster—A Special Kind of Emergency

It will be evident that there are several kinds of large-scale emergencies which do not qualify as disasters, as the latter has been defined. We could accept the broad definition of disaster, but this would detract from the purpose of a definition, which is to focus attention and to facilitate communication, not to cover everything one can think of. Moreover, the word *emergency* is perfectly adequate to cover all instances of extreme situations. Then the word *disaster* is reserved for special kinds of emergencies, the kind which involve an external event and its widespread disruptive effects on a community or significant part thereof.

Because disasters are relatively infrequent, most people have not experienced one. This makes it difficult to imagine what it would be like, how one would behave, and what sorts of things one could do. However, when it is realized that a disaster is simply another kind of emergency situation, this opens the door to insight and understanding. Most individuals and social groups have had some experience of, or training in, the handling of emergencies of various kinds, from automobile or other accidents, to family crises involving accidents, illness, and even death. We have developed emergency groups and facilities whose primary function is to handle emergencies, such as the police, firemen, physicians and nurses, hospitals, welfare organizations, the Red Cross and the St. John Ambulance, religious organizations, the Armed Forces, and so on. When an emergency situation is too much for the knowledge, skills and resources of the individual or parent, then he typically calls in someone who has more experience with that kind of crisis, whether it be a neighbor or emergency personnel and services from the community. Most communities have the emergency resources and personnel necessary to handle the normal run of emergencies in that kind and size of community. Major problems arise only when the emergency personnel and facilities are reduced or disrupted, or when there is a gross overload of emergencies—and this is usually the situation in a disaster.

A clear conception of the nature of emergencies provides a frame of reference for understanding the problems which arise, in small and large emergencies alike, and provides a basis for predicting what will happen and what kinds of preventive and remedial measures must be adopted. According to Miller's (1964) *general systems behaviour theory* groups, organizations, communities and societies, as well as individuals, may be thought of as living systems which require various inputs from their environment such as food, water, oxygen, stimulation, and information, and must have the opportunity to produce outputs of waste products and of energy as they act on the environment, produce goods, or communicate information. The inputs of energy and information are regulated by the living system in a manner to maintain relative balance of equilibrium of functioning. The manner and rate of functioning of the system or subsystems is controlled by feedback processes. Thus the individual orients and moves himself, or his car, according to information

reaching him through his various senses; a business organization regulated its policies and practices on the basis of its past experience of successes and failures and of projected information about supply and demand of money, labour, resources, and alternatives to the product; a nation-society regulates its action on the international level in terms of information about the results of its previous moves and about the behaviour of other nations. Any disturbance in the feedback processes may lead to "errors" and abnormal functioning, and even to disintegration of the system.

According to this viewpoint, emergencies are situations which involve such an excess or lack of essential inputs that equilibrium cannot be restored by the ordinary adjustive processes, so that emergency measures are called for. Thus the individual who experiences an excess input of alcohol, of force on the bones of his forearm, of disease germs, of threatening information, or of flammable heat in his house, must take emergency measures to handle the crisis if normal functioning is to be restored. In the meantime, the overload on his system may have produced abnormal behaviour and functioning, immobilization due to intoxication or fever, or disorganization because of terror. In a like manner, lack of essential inputs, of food, water, and information may also produce abnormal behaviour and require emergency action to get the relevant inputs. The reaction of a group or a community to too much or too little input follows the same pattern: abnormal functioning, and emergency measures to restore the situation. Thus lack of water in a community may lead to the emergency measure of water rationing and deep well drilling; an unusually large "input" of snow may require emergency measures of transportation, of distribution of food, and of snow removal; or an abnormally high frequency of accidents, illness, or food poisoning will overload and strain the normal functioning of a hospital, and require the adoption of emergency measures such as shortcutting the usual paper work on admissions, setting up cots in halls and nearby buildings, calling in doctors from outside, recruiting housewives who were formerly nurses, and so on.

It should be noted that what is an emergency for a community is necessarily an emergency for a large number of individuals in that community. And an emergency on the community level calls for emergency action on the part of individuals on the one hand and on the part of the whole community on the other.

To handle emergencies, individuals and the community must be able to mobilize emergency behaviour and resources. But where do these come from? *They must be available,* directly or by improvisation. The individual must have some experience or training, knowledge and skills, which he can quickly recall and bring to bear on the situation; he must have some special facilities and resources which he can use, such as an axe, a first aid kit, or diapers for bandages, or he must be able to call on someone else for emergency assistance. If he has no such reserve behaviour and resources, he by himself will be helpless. Fortunately very few people are in that unhappy position. All of us have some skills and resources that could be used in an emergency. The important questions are, how much, and how adequate.

In a like manner, most communities have the emergency personnel and facilities to handle the normal run of individual and social crises. However, if a community is to handle a major emergency, it, like the individual, must have special emergency resources. These include things like communication, transportation, and hospital equipment and supplies, alternative and reserve sources of these; the special characteristics, skills, and leadership qualities of the community members; plans for emergencies which are known and practised; and pre-established relationships with other communities and their emergency resources of personnel and equipment. An organization's or community's ability to handle a large-scale emergency will depend to a large extent on having and being able to mobilize such emergency resources. They make up the community's "capability" for emergencies.

Hass and Quarantelli (1964) have conceptualized the equilibrium which an organization, community, or social system normally maintains as a balance between the demands on the system and the system's capability of handling those demands—demands for goods, services, and especially for emergency assistance. An emergency of disaster proportions amounts to a negative shift in the demand capability ratio within that community such that the capabilities are not sufficient to meet the demands. This shift is usually the

result of a sudden and drastic increase in the demands—especially for emergency personnel and facilities like fireman, doctors, and hospitals, and a sudden reduction in the community's capability due to destruction and loss of emergency facilities and personnel. This is the double-edged sword of most disasters: the energy input of a large destructive external agent suddenly increases the emergency needs of the community and at the same time its destructive fury often sharply reduces the community's emergency resources. The only way to meet such an emergency is to have adequate and alternative emergency resources available.

## Disruptive Factors in Disaster

There are a number of ways in which a disaster event upsets the capabilities of the individual and community, with resulting disruption of behaviour and the social system:

(1) **Sudden death or injury** of a family member or of others nearby has a strong emotional impact on survivors and usually calls for some kind of immediate emergency action. Moreover, when communication and transportation facilities are disrupted and the appropriate helping personnel, such as doctors, are not available, the situation is doubly upsetting. Survivors may be, at least for a time, left to handle the resulting emotional, decision-making and action-taking problems on their own.

(2) **Destruction of homes and other property** and personal belongings is a very upsetting experience for the individual. He is suddenly deprived of some of the main features of his environment, things which are necessary for his habitual way of life. This creates an urgent need to salvage and protect what he can, and once more he is more or less on his own for a time, because others are caught up in the same situation and a protective agency, like the police, may not be available to offer its help.

(3) **Destruction of the means of satisfying basic needs**, like food supplies, water utilities, sources of heat, and sanitary facilities constitute a direct threat to the welfare and survival of the individual and his family.

(4) **The injury, death, and disorganization of emergency personnel**, together with destruction of their facilities and resources, deprive the individual of the help that he now so urgently needs.

(5) **Destruction of roads and vehicles** deprives the individual of the means of movement, making it difficult for him to take the injured to a hospital, to get supplies, or to seek the whereabouts of a loved one, all of which have become needs of the highest priority.

(6) **Breakdown of the communication system** is one of the main factors in isolating individuals and groups and in producing disruption of the social system. It is the factor that compounds the strains that other factors produce. A person cannot get in touch with family members and determine their well-being; he cannot communicate his needs to others who might help him; he cannot get a picture of the whole situation and its cause; he cannot ascertain the possibility of continuing danger and thus either be reassured or prepare to take appropriate evasive

action. The net result is that coordination of the rescue and remedial efforts of survivors is difficult or impossible, so that the situation appears chaotic as each individual seeks to do what he can about the problems that he faces. It should be noted that this seemingly random, aimless, and chaotic behaviour of survivors is sometimes mistakenly called "panic". However, it is not panic. The activity of the survivors may be completely uncoordinated, but each individual is usually acting with purpose as he seeks to do something about the problem uppermost in his mind at the time.

(7) **Threat and fear** also contribute to disrupting behaviour and the social system. When individuals perceive that their lives, their loved ones, and their property are in danger, their attention and efforts will be focused on this possibility and they will be less inclined to pay attention to and to cooperate with others in doing something about the overall situation.

(8) **Emotional shock** presents some survivors from participating in emergency action for at least a few moments. Shock is due to the abrupt and massive change in the environment which the destructive event produces: dwellings reduced to rubble, the streets a tangle of wire and trees, the presence of dead and mutilated bodies, and sound of the injured and dying. Most people are not prepared for this kind of experience, and the resulting emotional disturbance reduces their ability to respond adaptively and to cooperate with others.

(9) **An extreme sense of urgency** is experienced by survivors—to find a family member, to attend to an injury, to get someone to a hospital, or to fight a fire. They can think of little else at the moment and hence are not inclined to join forces with others on some other problem, nor to remember their role and responsibility as a member of, say, the Red Cross. Immediate problems are personal crises, which exclude attention to other matters.

(10) **The relative suddeness of disasters** is highly disruptive. Were the demand capability ratio to change gradually, individuals and groups could adjust to the change in phases. However, when a multitude of individual and group needs and emergencies erupt at once, orderly adjustment becomes extremely difficult.

Each of the conditions contributing to disruption of behaviour and the social system warrants analysis in terms of how it might be counteracted at the time in a disaster situation, or beforehand by preparation and training. It would be a good exercise and test for the reader to pause at this point, and in his own mind or in discussion with others, try to suggest some answers.

## Time and Space Characteristics of Disasters

As a means of describing and sorting out the behaviour and functions of individuals and organizations is disaster the area involved has been divided into zones, and the duration of disaster events into time phases. The zones may overlap, as may the time phases, but such a classification enables us to focus on particular events and to plot in an orderly manner the ways in which people react to and cope with disasters.

Wallace (1956) has divided disaster-space into five zones, depicted by the concentric circles in Figure 1. Area "A" is the area of total impact. It is the zone which has experienced the full destructive

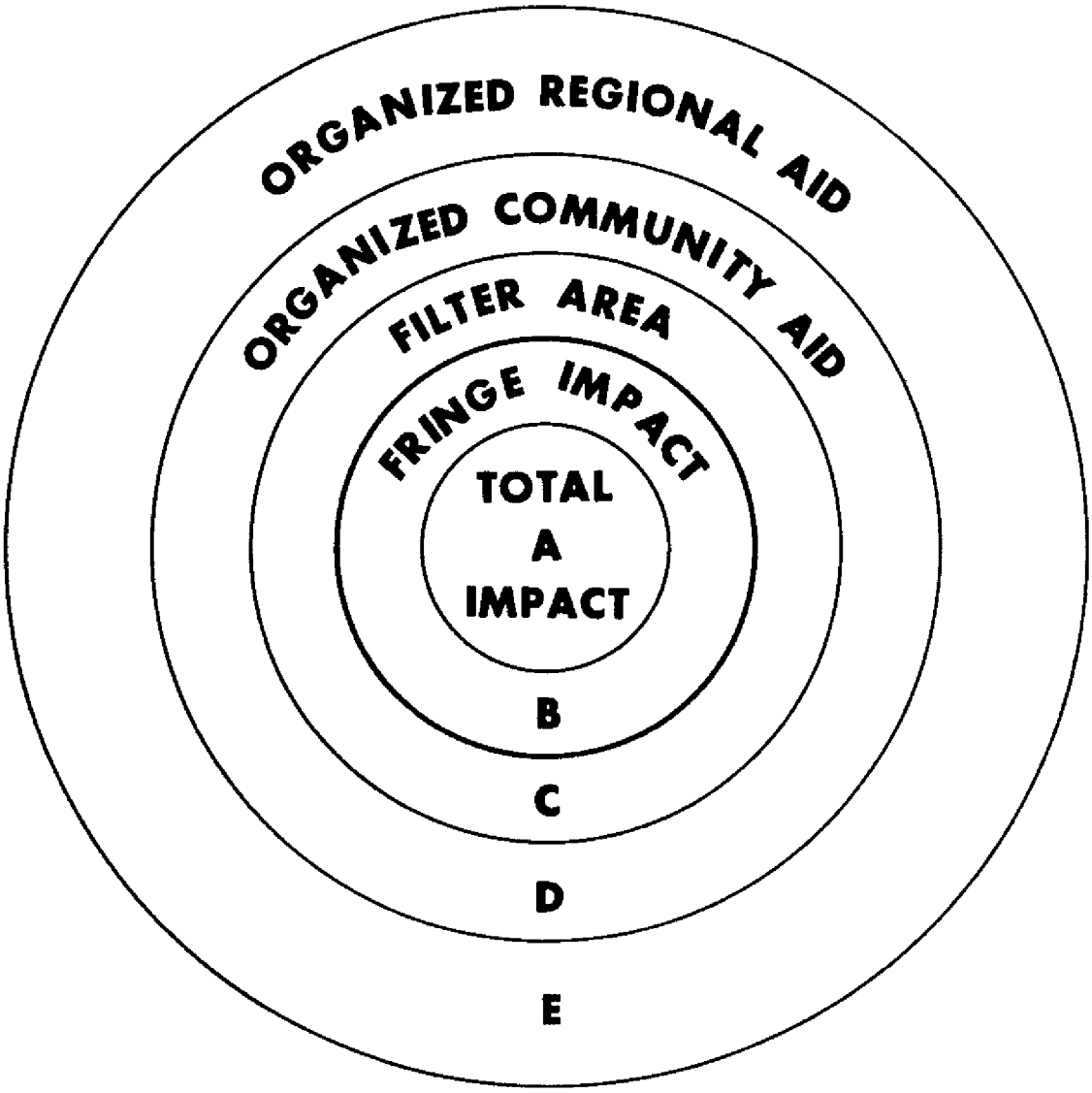


Figure 1. Graphic illustration of zones involved in disaster. (Adapted from Wallace, 1956)

fury of the disaster event. There may not be total destruction in the area, and indeed in some disasters there have been relatively few casualties in the total impact area. However, there is usually much more destruction as compared to adjacent areas. Moreover, the area of impact is usually fairly clear to the victims, as well as to helpers from the outside. The second or fringe impact area is closely adjacent to the area of total impact, and is distinguishable in that it usually has suffered only minor damage and few or no serious casualties. In the case of a tornado, it may be one side of a street where the houses have only suffered a few stripped shingles and broken windows while the houses on the other side of the street are reduced to rubble. Some people in the fringe area may suffer from minor shock. Their first reaction following impact is usually to check their families, after which they may investigate the impact area and begin rescue work. If the impact area is a continuing source of danger (e.g., from fire or flooding), they will evacuate their families. The third or filter area is the next adjacent area, which has suffered no damage or casualties. It is typically a source of help and services as well as the area through which traffic and information must pass back and forth from the impact area to the outside world. The fourth and fifth areas, or organized community and regional aid areas, are not directly affected by the disaster but are the primary source of organized emergency personnel and services—in the form of police and fire departments, medical and hospital services, and relief agencies.

The various areas which become involved in a disaster are seldom if ever neat and circular as illustrated in Figure 1. The total impact area may be a straight-line swath through a community as when a tornade cuts a path down several streets. The fringe impact area will be closely adjacent to this, but the filter area will tend to be a number of nearby sections, concentrated around roads and other means of access to the area of total impact. The area of organized community aid will most probably involve a number of areas nearby where there are organized community resources for dealing with emergencies. Organized regional aid may come from distant parts of the country, and even from other lands—Red Cross units from the United States moved in to assist after the Halifax explosion disaster, and financial aid has typically come from all over the North American continent as well as from Europe. Thus a realistic picture of disaster-space would reach out to any community that is a potential source of assistance.

The reactions of people in the different zones of disaster space is also a function of the particular time phase in which they happen to be observed. Five major time phases have been distinguished (Table 1). The first phase, pre-disaster phase, is really the period before the disaster. It is included in the scheme because of its importance in determining the effect of, and response to, the disaster. The pre-disaster conditions include such factors as the nature of the buildings in the area, the availability of shelters and communication facilities, the population's previous experience with disasters, and the availability of organized and trained personnel with appropriate resources. Additional factors include such things as the time of day the event occurs, and the chance presence of special services. For instance, the Alaska earthquake in 1964 happened at a time when most people were at home, and hence the response of organizations was relatively disorganized and ineffective at the beginning. On the other hand, a detachment of the National Guard happened to be in the area at the time, thus providing a ready source of organized and specially trained personnel and resources. As another example, the Niigata earthquake in Japan in 1964 occurred when most people were at work, and hence organizational response to the event was maximized.

The warning phase in a disaster covers that period from the first appearance of possible danger signs to the moment of impact. It may be subdivided into an early warning or alert phase, and a late warning or threat phase. The alert phase typically involves vague and ambiguous signs and partial information indicating the *possibility* of a disastrous event, at some time and some place. There is no certainty of impact in any particular area or at a particular time, but rather the likelihood that it may happen at a number of possible places. At most, precautionary behaviour is indicated, such as bringing the children home, closing windows, turning off electricity, and preparing to take shelter if the danger becomes imminent. People typically react with anxious scanning and checking for further information and clarification of the situation. The warnings are likely to apply equally to those in the impact, fringe, filter, and even the community aid areas

of disaster-space; in case of nuclear war, the regional aid areas will also be subject to warning. The warning may last for only a few seconds, and then quickly become threat and impact, as when a buzz-bomb or lone plane got through British defences undetected and suddenly appeared over a target city; it may last for hours and even days, which is the case with most hurricanes nowadays, and as was the case when the Cuban crisis of 1962 developed over a period of a week or more; or there may be no warning at all, as when a sudden and unexpected explosion occurs. Warnings may turn out to be false, or true. They may be noticed by a small or large proportion of the population, and they may be taken seriously, or ignored. Because of the crucial importance of the warning period, these and other problems associated with the warning phase will be discussed in more detail later.

The late warning or **threat period**, in contrast to the alert period, involves cues and information which are *not* ambiguour, at least to many people. This phase is usually short, and is followed by impact or by awareness that the danger has passed. Threat cues are typically an urgent indication for immediate protective and survival action, such as lying face down, or retreating to shelters. Even in a nuclear explosion like that which occured over Hiroshima, people had a few seconds from the late warning of a blinding flash until impact of the shock waves, enabling some to take protective action and save their lives. The threat period is usually localized as far as disaster space is concerned. Many persons in the impact and fringe area willbe sure that the event will hit them, while those in the filter, community, and regional areas experience little or no threat.

The **impact phase** is the period during which the disaster agent causes death, injury, and destruction. The force of the destructive agent is usually confined to a particular area, what has been called the area of total impact. People within that area are well aware that they have been hit. Some may be largely immobilized and literally "holding on" as in a tornado, and others may be frantically active as they seek shelter, try to close doors and windows and protect family members. They may have some weird experiences as when the vacuum created by a tornado literally floats heavy pieces of furniture and even people. For instance, in the Worcester tornado (Wallace, 1956) a mother, father and daughter were in the kitchen at the time. Potatoes had been put in the oven for baking a few minutes before the tornado struck. Suddenly the oven door opened, and "the potatoes came out and went over and hit my daddy on the head". Babies have been lifted from a parent's arms and children have floated away from their side.

Impact may last for only a few seconds or minutes, or may be prolonged as in the case of windstorm or flood. People in the fringe area may also think that they have been hit, and indeed may suffer minor injuries and property damage. Some of them may suffer from disaster shock, at least for a short time. People in the filter area will usually be aware that a disaster has occurred and have a fair idea of its location. Not having experienced actual impact, they are unlikely to suffer shock but may be somewhat breathless and excited insofar as they are aware that they were "near-misses". At the time of impact the community and regional aid areas may be largely unaware that a disaster has occurred, and are seldom aware of its precise location. There is typically a time lag before they receive the relevant information which will enable them to mobilize their resources and move in to provide emergency services.

The fourth phase of a disaster is the **emergency phase**. It begins at the end of impact and continues to the time when the dead have been removed, the injured cared for, secondary threats of things like fire and "hot" wires dealt with, and the survivors cared for with temporary shelter, food, and clothing. The emergency period may also be divided into two parts, the **isolation** phase and the **assistance** phase. The isolation phase is the period during which the survivors are on their own. It lasts until organized and professional assistance comes from outside the impact zone, marking the beginning of the assistance phase.

The period of functional isolation, when the survivors are on their own, varies from a few minutes to one or more hours. In a few instances, survivors have been isolated for several days, notably in the case of floods and following the nuclear explosions in Japan in World War II. The isolation period may be prolonged by one or more of several conditions. First, the outside world may lack information about the location and

## Table 1

### Time Phases in Disaster*

| Phases | Reactions and Functions |
|---|---|
| 1. Pre-disaster Phase and Conditions | Emergency resources, training, etc., influencing the effect of, and response to, impact |
| 2. Warning (1) Alert | Precautionary activity; seeking further information |
| (2) Threat | Protective and survival action |
| 3. Impact | "Holding on" |
| 4. Emergency (1) Isolation | Shock; social system disrupted; survivors extricate, rescue, give first aid, some preventive action vs. fires, etc. |
| (2) Assistance | Organized and professional assistance, medical care, preventive and security measures, and relief. |
| 5. Recovery | Individual rehabilitation and readjustment, restoration of property and community organization, preventive measures against recurrence. |

*Adapted from Killian, 1956; Powell, Rayner and Finesinger, 1953; Tyhurst, 1951; and Wallace, 1956.

condition of the survivors. Second, access to the impact zone may be hazardous and extremely difficult, as it often is following extensive flooding, tornadoes or hurricanes, and nuclear explosions. Third, communities adjacent to the impact zone may be ill-prepared to offer emergency assistance. Finally, a situation may arise in which potential helpers from adjacent areas may fear to enter the impact zone because of continuing danger there, for instance, from radioactive contamination. This might well be the case following a nuclear explosion.

It is the emergency period which presents the most difficult and pressing problems in disaster. For one thing, the social system, that network of roles, responsibilities, jobs, and facilities which is the basis for coordination in meeting the needs and problems of individuals, families, and groups, is usually disrupted and may collapse. Physical destruction may interrupt the supply of electricity and water, destroy the sewage pipes, damage or destroy sources of milk, groceries, and gasoline, or damage the means by which they are transported. Injury and death may deprive the community of emergency personnel like repairmen, firemen, doctors, and so on. Damage or destruction of communication facilities prevents people from calling for or offering assistance and from otherwise coordinating their efforts. Deaths and injuries, and the general fearfulness and threat of the situation make many people turn from their jobs and responsibilities to look out for their own welfare and that of their families. The result is that coordination of activities and of relationships between individuals and groups, together with lines of authority and control, break down so that individuals are for a time, left largely on their own to handle injuries, fears, and other problems of the moment.

The other source of problems in the emergency period is the effects of impact on individuals. Most of them will suffer at least momentary shock, and a proportion may be dazed and otherwise incapacitated for up to hours. At the same time, survivors will not only be deprived of their familiar environment but be confronted with a variety of urgent needs—to save themselves, to help the injured and dying, to look out for the welfare of family members, to search shattered dwellings, and perhaps to report for duty as a fireman, physician, or telephone repairman. Under such circumstances the behaviour of individuals appears disorganized and is seldom characterized by coordination with others. However, although the resulting scene be one of apparent chaos, a great many of the survivors are engaged in purposive behaviour as they free themselves from the rubble, look after family members, and care for those needing assistance. Indeed, the survivors often do most of the rescue work following a disaster, albeit in a uncoordinated, frantic, and rather inefficient manner.

A disaster-stricken area is seldom completely isolated for very long. Friends, relatives, and volunteer helpers, together with emergency personnel from the fringe and filter areas typically move in rather quickly, and in force—in some cases up to 25 per cent of the people in the fringe and filter areas have moved into the impact zone and in effect mounted a mass assault on the emergency problems. Initially these helpers, struck by the devastation and the urgent needs of survivors, and probably also impressed by the fact that they were "near-misses", pitch in to do something about each immediate problem they meet. Thus they forget about their organization roles, like that of fireman or policeman, and instead rescue victims, give first aid, and so forth. The result is that emergency action remains largely uncoordinated as local and adjacent area personnel attack problems as individuals or as small informal groups. For instance, in the case of the Baxter tornado, the Red Cross chapter in nearby Westley had a medical mobilization plan ready in case of disaster, with a registry of doctors, nurses, first aid personnel and community resources, classified by area and availability. But when the personnel were called by phone in order to implement the disaster plan, very few were available. Apparently they has already responded to the radio bulletins and moved into the impact area to work as individuals. As a result, the plan to establish some *organized* assistance and aid never went into effect.

With the arrival of *organized* emergency agencies and professional personnel from outside, usually from the community and regional aid areas, the emergency period enters the *assistance phase.* The agencies include neighbouring police forces, firemen, the Red Cross, the St. John Ambulance, Salvation Army,

emergency health and welfare teams, Civil Defence units, Armed Forces, and others. Each of these usually sets up a headquarters, seeks to determine the nature and extent of the problems and needs, to establish communications with the outside world, and to control and coordinate rescue and relief operations. They initiate systematic search and rescue, account for residents, reunite families, establish a record of casualties, damage and losses, set about establishing control of traffic, distribute supplies, guard property, and remove public hazards. However, this whole operation is generally not very efficient in the beginning. It is hampered by the physical destruction, by lack of communication facilities, by the mass and random influx of volunteer helpers and supplies, by lack of familiarity with the community, and by the inexperience of emergency agencies in establishing coordination between one another. However, some overall organization is gradually worked out within hours, or days at most, and survivors' basic needs of food, shelter and clothing are then handled in a more systematic manner.

The recovery phase following a disaster begins approximately when emergency tasks of search, first-aid, and emergency health and welfare care have been performed, and when survivors have been provided with temporary shelter and housing and necessary supplies of food and facilities. At this point emergency agencies typically turn their authority over to local civic officials. The primary tasks in the recovery period are relief, relocation, reconstruction, and general rehabilitation. As this process goes forward, something much like the original social system is typically re-established. How well and how quickly recovery progresses depends largely on the availability of money, supplies and labour, plus the adequacy of planning and organization. Just when the recovery period ends is difficult to say. Probably a community that has been devastated by a disaster will never be quite the same again. However, when the social and economic system is back to its pre-disaster level of functioning, recovery is complete in the sense that the effects of the disaster have ceased to have repercussions on the remainder of society.

## Special Characteristics of Nuclear Emergencies

It could be misleading to classify the emergency caused by a nuclear explosion as just another kind of disaster situation. For one thing, there is insufficient systematic information on the behavioural effects of nuclear explosions to enable us to make such a dogmatic statement. Moreover, the two bombs which were exploded on Hiroshima and Nagasaki were relatively small compared to what might be used in case of the future war. Both of these considerations indicate caution in drawing firm conclusions about the behavioural problems which a nuclear explosion would produce. Nevertheless, available evidence from personalized accounts of the emergencies in Hiroshima and Nagasaki (c.f. Hersey, 1946) and from a survey on morale in those cities three months after the war (United States Strategic Bombing Survey, 1947), indicate that the principles and conditions which determine how people behave and react in other disasters and bombings also apply to nuclear emergencies.

The nuclear emergencies in Hiroshima and Nagasaki differed in two respects from those following bombing in other cities and following natural disasters: First, there was much greater damage and destruction and more injuries and deaths in the former. In effect, this meant a much more drastic shift in the demand capability ratio both in terms of individual and social functions. More of the cities' emergency personnel and facilities were knocked out, reducing the community's capacity to handle emergency problems; and the blast, burns, and radioactive effects increased the problems a hundred fold in terms of dead, injured, destruction, and fires. In Nagasaki, some 16 per cent died and a somewhat larger proportion were seriously injured; in Hiroshima, 30 per cent died and another 30 per cent were seriously injured. Second, the population were almost completely unprepared in terms of past experience or expectations. Both cities were relatively untouched by bombs up to that time; they know absolutely nothing about atomic bombs and their effects; and they were expecting nothing at the time but were if anything relaxed by an all-clear from a previous alert which had sounded but an hour or so earlier. This lack of preparation and expectation together with the suddeness and extent of the impact produced widespread shock in the survivors. Moreover, when people recovered from the shock sufficiently to be aware of their surroundings, they were met with

frightening sights and sounds:mutilated bodies, some black or brownish, some burning, with eyes melted in their sockets, and flesh that peeled off when it was touched; the groans and cries for help; and the sight of a city that had all but disappeared. Apparently this created not only shock but outright terror. In addition, fires were starting up all over the place, as the rubble of houses made contract with stoves and live wires. In the face of these conditions, most of those survivors who were able headed out of the city in a mass exodus.

The flight reaction of survivors was unusual in relation to other disasters which strike suddenly. However, no new principle would seem to be involved. The extreme suddenness and unexpectedness of the event together with the extent of the destruction made the situation especially terrifying.IIn the context of war and knowledge of bombings of other cities, the survivors were probably afraid of what might be coming next, especially as darkness descended on the city. To make the location even more untenable, fires were starting up all around. In such circumstances, to get out was a reasonable response.

Available information indicates that other reactions of the survivors, while often extreme, could be predicted from our knowledge of emergency behaviour and from the extreme conditions of suddeness, unexpectedness, and the demand capability strain associated with the bomb. Thus parents almost invariably adopted their family roles and rescued their children and other family members. Apparently many survivors also adopted a helper role and turned aside from their flight to answer a cry for help from less fortunate victims, or to join small informal groups in rescue or fire-fighting tasks. And some assumed their emergency organization roles as physicians and firemen and set about caring for the injured and fighting fires.

Because of the drastic shift in the demand capability ratio, large numbers of injuries and deaths, the widespread destruction of emergency facilities and other goods and services, the survivors were largely without food, clothing, shelter and medical care for several days. In effect, the isolation phase of the emergency period lasted much longer than in most natural disasters. However, while this made for critical deprivation and suffering, it may be attributed to the unexpectedness of the event, the extent of the destruction, and lack of preparation.

The emotional after-effects of the atomic bomb in these cities was essentially an exaggerated version of that which has been observed following conventional bombing attacks on cities in Western Europe. The people suffered from apathy, presumably produced by their great personal and material losses and a dark and foreboding future; acute fear and startle reactions were common, sudden noises like that from a plane or sudden flashes of light would result in a rush for shelters; anxiety-laden rumours were widely circulated, for example, that the atomic bomb had deposited a poison on Hiroshima which could make the place uninhabitable for seven years.

In spite of the extremities to which the survivors of these two cities were subjected, the motivation to return to their homes prevailed and within 24 hours after the bomb exploded, most of them had returned to live amidst the rubble of their home ground. And in terms of recovery, Hiroshima, for example, is a thriving new city today, with new industries, a new university, and nearly double the population it had when the bomb devastated the community.

Although the atomic bomb produced relatively "normal" emergencybehaviour in survivors of Hiroshima and Nagasaki, we can expect important deviations from the usual pattern in case of future nuclear explosions. The key new factors are the destructive power of nuclear weapons, health hazards from radioactive contamination and fallout, and people's knowledge and fear of these.

The explosion of presently available nuclear weapons might not alter the essential features of disaster space as described above, at least for a short time. There would be an impact zone, fringe and filter areas, and community and regional aid areas. However, the impact zone from a single explosion would cover a wide area and the destruction would be even more extensive than it was in the two Japanese cities.

Moreover, because such weapons would likely be used on areas with high concentrations of industry and population, facilities and personnel for dealing with the emergency would be seriously depleted—as they tend to be concentrated in the cities also. If many nuclear bombs were delivered with reasonable accuracy, though one might still identify filter, community and regional aid areas, they are likely to contain only smaller communities with less resources of personnel and facilities for dealing with such an emergency. As the dangers from radioactive fallout develop and spread, within hours to days, the filter, community and regional aid areas may be largely prevented from offering what assistance they have available. Finally, the health problems created by radioactive contamination would require more extensive and specialized services than other disasters have. These physical consequences of nuclear explosions must be taken into account in the development and deployment of emergency measures.

### Difference in Responses to Nuclear Disaster

Knowledge of the effects of nuclear disasters is likely to alter the behavioural reactions and problems that are associated with natural disasters, in the following ways:

(1) **The response to warning may be exaggerated** and difficult to control. In a number of areas the appropriate response will be to evacuate. If the warning is credible and is accepted as a call to action, evacuation will occur. However, if the people are told, if they believe, or if rumours lead them to think, that time is short, the pressure of fear may result in precipitous flight, without consideration of what they should take with them, of the appropriate routes, or of the possible consequences of an uncontrolled mass exodus. If they also believe that the escape routes are limited or are closing, the exodus could well turn into panic. To prevent such a calamity it would be essential for the authorities to provide accurate, authoritative, and credible information at all times, to initiate evacuation in phases, and to maintain rigid traffic control.

(2) **Early symptoms of radiation sickness may appear** in survivors following a nuclear explosion. These constitute a new and serious consequence of disaster and would call for more than the usual medical and paramedical personnel with specialized equipment and facilities. The problems here will be compounded by the fact that some of the signs of shock are much like radiation symptoms, including vomiting, diarrhoea, lethargy and fatigue, tremor and excitability, and loss of appetite. This will pose difficult problems for differential diagnosis. Moreover, primed with the knowledge and fear of possible radiation sickness, survivors may well tend to interpret any vague symptom as evidence of contamination, thus adding to their overload of fear. In addition, some people are likely to develop various bodily symptoms simply as a response to fear of radiation sickness, adding further to the overload and difficulty of diagnostic problems. Under such circumstances it will be more difficult to reassure and calm victims, and to evoke constructive and coordinated behaviour. Some of the means of dealing with this problem will be presented in the following chapter.

(3) **Knowledge of radiation hazards will reduce the convergence** behaviour which typically occurs after natural disasters. Potential helpers from the fringe and filter areas will probably be concerned to take protective measures for themselves and their families against the imminent fallout and to avoid the impact area. Those who might have converged on the area to

satisfy curiosity and exploitation motives are likely to be deterred by the same fears and concerns. Whether there will be some convergence of materials and equipment will depend on the extent of the nuclear strike and the availability of such resources in outlying regions. Communication facilities are likely to be overloaded as usual, particularly as people from the outside seek information about the damage and about people they know.

(4) **The homing tendency will be reduced** following a nuclear explosion, compared to that observed following war, bombing, and some natural disasters. Insofar as evacuation has occurred prior to the strike, one of the conditions for homing will obtain. However, fear of radioactive contamination will probably make people loath to return. Indeed, one of the problems may be that of getting people to move back into areas even when the authorities have declared them safe.

(5) **The dangers from radioactive fallout may necessitate retreat to shelters** for some time, especially in the fringe and filter areas, and possibly over widely scattered regions. Fear of radiation effects may motivate most people adequately to take such a protective measure. However, some may be difficult to convince because evidence of contamination is not directly available by sight, sound, or smell. Shelter living in itself will pose special problems. However, these can be handled and it is unlikely that people would have to remain in shelters for longer than two weeks, even if the greater part of the country was subject to fallout from numerous nuclear explosions (Glasstone, 1964). The problems of shelter living will be discussed in a separate chapter.

(6) **Mood and morale changes** observed following natural disasters are likely to be altered with a nuclear emergency. The extent of the destruction and casualties will have a more profound and more lasting effect on survivors—as it did in Hiroshima and Nagasaki. Shock will be more widespread, fears of radiation effects will persist for some time. Under these conditions the dependency stage of the disaster syndrome may well be exaggerated and difficult to overcome, and people are less likely to experience feelings of euphoria. Whereas survivors will be faced with the common elementary problems of survival, it is not certain that they will exhibit identification with the whole community and develop a spirit of mutual help and sharing. What happens here would probably be a function of the availability of adequate supplies and facilities for survival of the whole community. If things like water, food, and shelters are in short supply, ugly competition for these necessities could break out. The morale of survivors may be weak, especially if a large part of the country has been affected.

It is certainly likely that a nuclear emergency would result in new and difficult problems. However, the effects on human behaviour are still those of a drastic negative shift in the demand capability ratio. The destructive input is greatly increased, and people would be subject to two novel input stresses, that of radiation effects, and fear of destruction and radiation hazards. The strain for both individuals and the social system would be very much greater than in disasters to date. However, as with other disasters, the best means of minimizing suffering and losses will still be those of adequate preparation and training, in terms of both the individual and the social system.

## Selected Readings

Hass, J.E., & Quarantelli, E.L. Organizations under stress: Towards a theoretical explanation of variation in response. Working Paper No. 4. Presented at the Annual Meeting of the American Sociological Society, Montreal, Sept. 1964.

Hersey, J. *Hiroshima.* New York: Knopf, 1946.

Tyhurst, J.H. Individual reactions to community disaster. *Amer. J. Psychiat.*, 1959-51, *107*, 764-769.

Wallace, A.F.C. *Tornado in Worcester: An explanatory study of individual and community behaviour in an extreme situation.* Disaster Study No. 3. Washington: National Academy of Sciences – National Research Council, 1956.

Westley, W.A. *The formation, nature and control of crowds:* Ottawa: Defense Research Board, Department of National Defense, 1956.