

## **THOUGHTS ON THE HIGHER ORDER TAXONOMY OF DISASTERS**

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### **INTRODUCTION:**

(1) Any discussion of disasters depends on, and often references, a common understanding of disaster taxonomy. Such an understanding does not depend on recognition of the application of a taxonomy to the events – every emergency services practitioner understands that an earthquake (a second level of classification) is a natural disaster (the level of higher order taxonomy addressed in this paper).

(2) The Emergency Services Management program at the University of Richmond is developing a reference database of disaster events, with a focus on locating such events in time, place, and type. Database development enforces a certain degree of discipline in the characterization of events. In that process we found that common alternatives at the highest level were unsatisfactory for classifying events. This paper suggests what we feel to be a reasonable system of classes at the highest order of the taxonomy of disasters.

### **TAXONOMY:**

(3) A standard dictionary defines taxonomy as “the systematic distinguishing, ordering, and naming of type groups within a subject field” (Gove 1993, 2345). Perhaps the most common application of taxonomy has been in the classification of life forms in biology. In this context, Kirkpatrick (1995) refines the definition to include classification into set groups based upon characteristics common to all members of the group. Kornfeld (1997) suggests that taxonomy teaches history, identifies subdivisions of like things, and points out how such things may be related in ways that are not immediately obvious. And Cummins (1996) adds to this list the role of taxonomy in describing diversity and providing classifications as a basis for explanations of relationships.

(4) Taxonomy has been examined as a tool for the study of issues in disaster sociology. Kreps (1989a, 1989b), Quarantelli (1989), Drabek (1989), Turner (1989), and Bailey (1989) debated the use of taxonomy for theory building in sociological research in the International Journal of Mass Emergencies and Disasters. However, this did not define a classification scheme that relates the crash of Pan American Flight 103 to that of Trans World Airlines Flight 800 (a narrow comparison) or the eruption of proto-Krakatoa in 535 AD (Keys 1999) (a much wider comparison). Structuring sociological taxonomy when there is little agreement on broad relationships between events may be premature.

**THE CURRENT STATE OF THOUGHT:**

(5) An examination of commonly available sources published during the last decade (see Table 1) suggests there is common agreement on naming one disaster class – natural disasters. An in-depth examination of what various sources term a natural disaster would reveal agreement of what event qualifies as a natural disaster is by no means universal. However, for the purposes of this study, we assume that natural is an accepted class.

Table 1. A Comparison of Higher Order Classes of Disaster Events

<b>FEMA 1990</b>	<b>Hy and Waugh 1990</b>	<b>Hoetmer 1991</b>	<b>FEMA 1994</b>	<b>Waugh 2000</b>	<b>Schneid and Collins 2001</b>
Natural	Natural	Natural	Natural	Natural	Natural
		Ecological			
Human-caused or Technological (note 1)	Man-made	Technological	Technological	Man-made (note 2)	Man and Nature
National Security		Civil	National Security		
					Emerging (note 3)

*Notes:* FEMA is the acronym for the Federal Emergency Management Agency of the United States.

1. Included civil disturbances and riots.
2. Included workplace violence, terrorism, and civil defense as man-made hazards and disasters.
3. Included event types considered national security and technological in other classification schemas.

*Sources:* Hoetmer, Gerard J., “Introduction,” in Emergency Management: Principles and Practice for Local Government, Thomas E. Drabek and Gerard J. Hoetmer, eds., Washington, DC, International City Management Association, 1991, pp. xvii-xxxiv. Hy, Ronald John and William L. Waugh, Jr., “The Function of Emergency Management,” in Handbook of Emergency Management: Programs and Policies Dealing with Major Hazards and Disasters, William L. Waugh, Jr., and Ronald John Hy, eds., New York, NY: Greenwood Press, 1990, pp. 11-26. Schneid, Thomas D. and Larry Collins. Disaster Management and Preparedness, Boca Raton, FL, Lewis Publishers, 2001. Waugh, William L., Jr., Living with Hazards, Dealing with Disasters: An Introduction to Emergency Management, Armonk, NY, M. E. Sharpe, Inc., 2000. United States, Federal Emergency Management Agency, Introduction to Emergency Management, Washington, DC, U. S. Government Printing Office, 1990. United States, Federal Emergency Management Agency, Emergency Preparedness U.S.A., Washington, DC, U. S. Government Printing Office, 1994.

(6) There is a range of opinion as to the title of events resulting from human action, including man-made, technological, and human-caused. Man-made seems to require a direct sense of action – how do we explain failure as opposed to action? Man made the building and perhaps laid the foundation for failure. But what if that failure is facilitated by natural causes, by material fatigue, or design flaw such as the Tacoma Narrows Bridge or the Kansas City walkway collapse (Levy and Salvadori 1992)? Similarly the term technological does not seem to account for all cases – is a wildfire set by a careless camper really an example of technology at work? A human systems failure model may offer a better approach by considering events as outcomes of either human input (the camper’s match), or failure to input (the design failure case), and processes (material fatigue as an example). Possible examples are shown in Table 2.

Table 2. Disaster Events as Human Systems Failures

Possible Inputs	Process	Output
signal failure, operations at high speed, inattentive crew, poor track maintenance, material failure, personnel training	derailment of engine and passenger cars	railway accident with injuries, deaths, property destruction, and loss of use
bridge design with protective pilings on upriver side only, poorly marked channel, heavy rains resulting in river flowing more rapidly than normal, tugboat captain suffers disabling seizure	barges ram bridge causing collapse	vehicles fall into river with injuries and deaths, roadway closed with economic impacts
facility maintenance, operator training, design of control room facilities, production pressures, lack of local emergency planning, poor zoning, lack of public education on emergency procedures, poorly prepared emergency services, weather conditions that help spread released material	loss of control of hazardous process	immediate and long term deaths from release of hazardous materials

*Note:* These are composite examples of system elements from numbers of similar incidents in various countries at various points in time.

(7) Where do events of human violence fit in the scale of disasters? There are two solutions - consider them man-made or classify them as national security threats. The national security approach conforms to the inclusion of civil defense in comprehensive emergency management. However, a national security model is inadequate in understanding genocide or state sponsored terrorism directed against its own citizens, events that might actually improve national security, or to categorizing much smaller events such as riots and civil disorder which do not threaten national security.

(8) Is a disaster that results from a failure of human systems different from a disaster that result from conflict? The outcomes seem to be similar – physical destruction, death,

displacement of populations, and long-term contamination of the environment. The range of events may seem to overlap. For example, is a terrorist bombing with a dozen fatalities a greater disaster than the Bhopal chemical disaster, which may have killed as many as 30,000 (Lapierre and Moro 2002), simply because it is terrorism?

(9) There are discriminators which clearly separate human systems failures from conflict based disasters. The primary one is intent. The owners of the South Fork Dam were ignorant of the probable consequences of their actions and appeared uncaring in the aftermath, but it seems unlikely they intended to destroy Johnstown and drown 2000 people (McCullough 1987). On the other hand, genocide, whether in the Third German Reich (Weiss 1996) or in Rwanda (Power 2002) is clearly intentional. Contamination of land and excess long-term deaths from radiation resulting from nuclear testing seem to have been unintentional byproducts of a lack of understanding combined with a drive to meet a threat to national existence (Fuller 1984). In contrast, the bombings of Hiroshima and Nagasaki were clearly intended to kill people and destroy property.

(10) A second discriminator may be scale. There have certainly been single natural disasters that have generated 500,000 or more casualties (Longshore 1998), and as noted above Bhopal may have resulted in 30,000 deaths. However, such events tend to be short in duration, as opposed to terrorist campaigns which may extend for decades, and appear to generally result in fewer deaths in proportion to the entire population.

**RECOMMENDATION:**

(11) We believe three classes describe the highest order range of disaster events as shown in Table 3: natural disasters, human systems failures, and conflict based disasters.

Table 3. A Suggested Higher Order Classification of Disasters

<b>Class</b>	<b>Distinguishing Characteristics</b>
Natural Disaster	any event which reaches the definition of a disaster, which results from natural forces, and in which human intervention is not the primary causation of those forces
Human Systems Failure	any event which reaches the definition of a disaster and which results from significant human failure in any portion of a systems definition of the event, including input, process, and output – this may include events which wholly involve the built environment or which initiate events that are otherwise natural in their action
Conflict Based Disaster	any event which reaches the definition of a disaster and which results from internal conflict within a nation or external conflict directed at it, including not only the obvious threats of war, revolution, and terrorism, but also politically, racially, or economically based civil disorder, as well as internal state sponsored terrorism, genocide, and ethnic cleansing

## FOR FURTHER RESEARCH:

(12) The focus of this article has been on the highest order of a taxonomic scheme for disasters, which we have termed a Class. However, it seems likely that there are at least two lower levels in such a scheme – in the absence of better terms, Types and Sub-Types. Relationships between Types and higher Classes are by no means obvious, and may vary by causation. Additional research in this area may be warranted.

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