The Role of the Media In Hazard Mitigation and Disaster Management

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Reducing the losses in life and property caused by natural hazards is a compelling objective now receiving worldwide attention. Scientists and engineers now believe that the knowledge and technology base potentially applicable to the mitigation of natural hazards has grown so dramatically in recent years that it would be possible, through a concerted cooperative international effort, to save many lives and reduce human suffering, dislocation. and economic losses. Communications are central to this effort—for public education, early warning, evacuation, and post-disaster relief.

The United Nations has declared the 1990s to be the International Decade for Natural Disaster Reduction (IDNDR).[2] In conjunction with scientists, engineers, and government officials throughout the world, it is developing an agenda for U.N.-system activities during the Decade, as well as a mechanism to coordinate the activities of participating nations and international scientific and engineering organizations. The focus of this Decade of activity is natural hazards, including such rapid-onset geophysical events as earthquakes, tsunamis, and volcanoes and such meteorological events as typhoons, floods, and tornadoes. Other mixed-origin events such as wildfires and landslides will also be included, as will rapid-onset infestations of grasshoppers and locusts. (Outside of the immediate framework of the Decade will be such slower-onset events as desertification, *el Niño*, and global warming, as well as man-made hazards as exemplified by Bhopal and Chernobyl.)

The IDNDR will encompass both research and implementation of projects aimed at greatly reducing the losses of lives and property from this wide variety of rapid-onset natural events. Scientists, engineers, and hazard specialists will make the principal contributions, working within national programs, and their research results will be shared throughout the world. The roles of training, education, and information dissemination will be given a high priority.[3]

Plans for the Decade stem from scientists' and engineers' belief that we are unnecessarily exposing ourselves to losses from natural hazards.[4] Specifically, we should focus primary attention on planning and preparedness for hazards rather than waiting passively for them to strike. The belief is that post-disaster relief, while humanitarian in its motivation and certainly necessary, is relatively ineffective as compared with various actions that could be taken before disaster strikes. In any case, preparedness is the key to effective action after the event.

In essence, the Decade's activities seek to shift the emphasis from post-disaster relief to predisaster risk reduction. The key tasks in risk reduction are:

◆ avoiding habitation in hazardous areas;

◆ developing structures resistant to the onslaughts of hazards;

◆ developing the ability to rapidly evacuate hazardous areas or to shift residents to hazard-resistant structures;

◆ reducing or eliminating natural hazards through technological intervention (*e.g.*, dams, plantings, beach groins); and

◆ establishing, through preparedness, the means to quickly recover from disasters—with minimal additional suffering and loss of life.

Communication in its various forms is critical to the success of the Decade. It underlies virtually all elements of the hazard-mitigation process. The capabilities of communications, data-gathering, and data-management technology have leaped forward in parallel with our increasing knowledge about the origins and behavior of natural hazards and the mitigation of their effects. Indeed, advances in telecommunications and computer sciences are among the major contributors to the recognition that technology can do much to blunt the effects of natural hazards.

In meteorology, the deployment of geosynchronous satellites for telecommunications and for Earth observation, combined with the use of supercomputers to analyze the data gathered from space, has led to highly sophisticated models of tropical storm formation and behavior, providing earlier and far more reliable information with which to plan evacuations and other hazard-mitigation strategies. Similarly, remote sensing from space can now identify insect infestations by detecting changes in the color of the Earth's surface. Seismological devices, also linked to supercomputers, are greatly improving our understanding of earthquake propagation. The hope is that this increased knowledge will enable us, in time, to provide reasonably early warnings about earthquakes in the same way we can increasingly do so for volcanic eruptions, tsunamis, and various meteorological events.

Mass communication is inextricably entwined with disasters and hazard mitigation. The electronic and print media, reflecting great public interest and concern, provide extensive coverage of natural disasters, particularly those with strong visual impact. And increasingly—as forecasters have gained the ability to predict (*e.g.*, the Mount Saint Helens volcanic eruption, or periodic floods or tropical storms)—the media have covered the near-term prediction and relief planning phases of the event. The media have significantly improved the level and sophistication of their pre- and post-disaster coverage in recent years by using new technology and consulting technical experts better able to describe the causes and mitigation of disaster. Indeed, communications technology has become so advanced that we now often have electronic media coverage of the event itself—witness a midwestern U.S. television station's use of a helicopter-mounted television camera to cover a rampaging tornado, or the live coverage of volcanic eruptions and magma flows in Iceland, Hawaii, or Washington state.

The print media, too, have benefited from advanced technology. Facsimile transmission and closer linkages between reporters and specialists in government and academia have deepened understanding of the causes and impacts of these disastrous events and, no doubt, have had some effect in reducing long-term exposure and risk.

Perhaps the main reason for the enhanced media coverage is that technology has made remote television transmission technologically and economically feasible. Satellite technology frees the communicators from the limitations of "hard" wires. Further, television's recently enhanced audio and video quality, the instantaneous availability of footage occasioned by the shift from film to electronic photography, the reduced weight and bulk of equipment, and the greatly reduced cost of both the equipment and of access to communications channels have led to a proliferation of information and greatly enhanced the media's capability to report on hazardous events whenever and wherever they occur. Indeed, the satellites that revolutionized remote transmission have also provided the first glimpse of the next generation of capability—the use of pictures from space to predict or to report on events occurring on the Earth's surface.

Earth-observation satellites increasingly are being put to non-defense uses ranging from selection of the optimal time for harvesting crops to locating promising sites for oil and gas exploration. Increasingly, hazard mitigation is one of the better applications of such capabilities. In the future, however, one can envision far greater use of remote-sensing, not only to identify incipient disasters—such as an arid region prone to forest fires—but also to support post-disaster relief by providing such information as the location of trouble spots (satellites can now capture images with a resolution as small as one or two meters).

Such satellite capabilities are not now used extensively by the media except in weather forecasting, partly because they are based on a relatively new and expensive technology and partly because the pictures from space tend to be "stills" rather than moving images. Nevertheless, the media are likely to develop this capability as the costs fall and they gain experience in presenting the data informatively and attractively. It is very likely that their capabilities will come to exceed those of the hazard mitigation community, and the latter may be able to benefit from information gained by the media in the course of its work or from excess capacity that could be "borrowed."

Clearly, mass communications technology already has had a significant impact on how the public learns of and perceives the impact of natural hazards. And as the costs are further reduced and the capabilities of these technologies improve, the level and sophistication of information presented to the public will also be enhanced. But in parallel with media-oriented telecommunications, disaster-preparedness and relief organizations within government, the United Nations, or volunteer organizations have begun to enhance their communications links as a means for improving the efficiency and efficacy of their traditional services. The United Nations Office of the Disaster Relief Coordinator, for example, now has a small portable ground station capable of audio transmission, which its specialists in post-disaster relief can carry into the disaster area. And similar capabilities are available to national organizations throughout the world, usually via national telephone networks and leased satellite channels.

In addition to the vastly improved opportunities that telecommunications technologies have provided to report on prospective, ongoing and recent disasters and relief efforts, their capabilities have slowly begun to shift our thinking away from post-disaster relief and toward more effective means of coping with sudden natural hazards. Figure 1 details a large number of linkages between communications/information technology and hazard mitigation. But, perhaps more important, opportunities for future hazard-mitigation techniques are greater still.

In essence, sensors and telecommunications links to date have been used primarily to enhance the quality and precision of traditional means of anticipating and responding to disasters. But the information provided by these new techniques, combined with a variety of scientific advances—which have often been the result of analyzing new telecommunications-based data—is revolutionizing our understanding of the causes and mitigation of disasters.

Satellite-gathered data, combined with the data-handling capabilities of supercomputers, have led to new theories about the formation and behavior of tropical storms. These increasingly sophisticated models of the behavior of natural systems in time will form the basis for earlier and far more accurate storm warnings. Similarly, remote seismological devices, coupled with transmitters, whose output is analyzed by advanced computer, are greatly enhancing our understanding about the occurrence and impacts of earthquakes and tsunamis.

The objective of this paper, then, is to point out that better linkages between the public media and the community of hazard-mitigation researchers and practitioners—whether the linkages are scientific, technological, or service-oriented—can make anti-hazard efforts more effective and, more important, can accelerate the shift in both the public's and the expert groups' thinking toward effective predisaster initiatives.

Our ability today to modify natural hazards is very limited, and perhaps will remain so for many decades or even centuries. But hazards need not inevitably lead to disaster. Wouldn't it be most heartening if the media could report minimal loss of life and property damage following a future earthquake that registered at 7.3 on the Richter scale, rather than thousands of lives lost and disrupted and damages in the billions of dollars or yen or pesos? It is possible to shift from an increasingly disaster-prone world to one where people live more harmoniously with nature and do not view natural hazards in a fatalistic way.

To this end, the electronic and print media could embark on a two-step process to enhance the quality of its hazard-related services.

Sharing of Media Facilities

The first step is to foster still-closer linkages with the hazard-mitigation community and share their vast information-gathering and transmission resources, when appropriate and available, with disaster-mitigation organizations.

The enormous technical resources of the major media could be very helpful to hazard-mitigation specialists with little or no adverse impact on media operations. In the post-disaster phase, for example, the facilities established by the media to report on an event are often far more robust and more promptly operational than those of relief organizations, whether governmental or voluntary. As the journalistic needs for the equipment are intermittent, sometimes as little as a few minutes per day, these channels are potentially available to specialists as a means for better assessing the nature and extent of damage, local relief requirements, the need for specialized recovery equipment, and unique problems or opportunities. The circuits can be used to answer such questions as: Is the airport open? What pharmaceuticals are needed? What technical/medical/organizational specialists are required? (Of course, the risk in relying on broadcasters' facilities is that the media cover only those disasters they deem newsworthy and will not deploy equipment to cover other hazardous events, serious though they may be.)

Similarly, as predictive capabilities improve, as they have for meteorological events and as they can for geophysical phenomena, a more systematic worldwide linkage with the media could improve early warning and can go to the next step in promoting an evacuation or alternative protective strategy. For example, television and radio receivers might potentially be adapted to enable them to deliver warnings even if they are turned off at the time. That could be crucially important, for example, if techniques for tornado prediction,

Figure 1: Linkages Between Communications Technology and Management of Various Classes of Hazards.

Hazards	Satellite Sensors	Satellite Remote Telemetry	Radio and TV	Print Media	Terrestrial Sensors
EARTHQUAKES		linking sensors to central facilities and reverse	transmitting warnings as well as protection information	education for protection, including evacuation and building techniques	strain guages vibration sensors
LANDSLIDES	meteorology monitoring soil wetness	transmitting data to central facilities and reverse	transmitting warnings	education for protection, including evacuation and building techniques	strain gauges wetness monitors
TSUNAMIS	wave surge detection	transmitting data to central facilities and reverse	transmitting warnings	education for protection including evacuation and location techniques	subsea vibration sensors
VOLCANOES	optical and thermal monitoring	transmitting data to central facilities and reverse	transmitting warnings	education for protection including evacuation and location techniques	vibration and thermal sensors
FLOODS	optical monitoring and meteorology	transmitting data to central facilities and reverse	transmitting warnings	education for protection including evacuation and location techniques	flow, rain, and river height sensors
TYPHOONS	meteorology	transmitting data to central facilities and reverse	transmitting warnings	education for protection, including evacuation, location, and construction techniques	meteorology monitors for storm surges
TORNADOES	meteorology and optical monitoring	transmitting data to central facilities and reverse	transmitting warnings plus specialized monitors, perhaps with sensors	education for protection, including construction and protection techniques	doppler radars
WILDFIRES	optical and thermal monitoring	transmitting data to central facilities and reverse	transmitting warnings	education for protection, including prevention and resistant construction	optical and thermal sensors to support visual siting

siting and tracking are enhanced or if coastal-area storm flooding can be predicted more accurately. In essence, a high-technology approach such as building an early-warning capability into radios or television sets is but one step removed from the concept of public air-raid sirens. It should raise no issue of privacy and the technology is certainly not beyond our grasp.

Integration of the Media into Disaster Mitigation

The second step in building links with the news organizations—and the one that hazard specialists believe has the greater humanitarian potential—is to more effectively link the media into an intensified effort in hazard mitigation, including such activities as:

- risk assessment;
- avoidance measures;
- early warning and evacuation;
- public awareness and education; and
- organization for self-help and effective response to risk.

For example, massive losses from the periodic cyclones in Bangladesh could be significantly reduced by media-related actions in all of these areas. To the people of the region, these tropical storms come very suddenly, leaving inadequate time for evacuation. Further, while the winds do considerable damage, the principal hazard is flooding. A very effective response in this flat delta would be the simple creation of high ground for refuge—simple mounds of earth or perhaps flood-resistant multi-story public buildings such as schools. Radio and television could broadcast early warnings and evacuation information and, as important, increase public awareness about the risks and responses. To have any significant effect, a preparedness plan would have to be in effect before the storm, and government and the citizenry must have organized to build high ground.

Indicative of the problem—and the opportunity—is the recent flooding in Brazil, and particularly in the Rio de Janeiro area, where poorly constructed buildings on steep slopes slid down the hills and collapsed under heavy, but not unpredicted, torrential rains. Hundreds lost their lives. No doubt, the principal cause of this tragedy was the inappropriate development of land. These steep slopes should have been left in their virgin state or, at most, converted to recreational use. Instead, they first became plantations, which destabilized the slopes, and more recently became squatters' settlements. The long-term solution is outside the capabilities of either the media or of hazard experts, but the exposure to risk can be greatly reduced if the inhabitants of these steep slopes had been more aware of the risks and if an early-warning system and evacuation plan had been set up before the rains inevitably came.

Here the media have the definitive opportunity to play a leadership role in the transition in thinking and action away from post-disaster relief and toward preparedness and hazard mitigation. They can convey, for example, this kind of credible, non-sensational, but valuable message to the public: A healthy future will require hazard-resistant structures, properly located, complemented by timely evacuation techniques and a rapidly responsive, efficient post-disaster relief system.

Among the most obvious near-term contributions that the electronic media could make to a worldwide hazard-mitigation effort is in helping to develop early-warning systems capable of reaching people in even the most remote hazard-prone areas—especially where the reliability of telephones and other systems is tenuous under the best of circumstances. Bangladesh, for example, has suffered from tropical cyclones, with a single storm in the past decade having led to the loss of almost a half million people. As radio and television are introduced into remote regions, broadcasters' adoption of early-warning responsibilities would be a major contribution in limiting the impact of natural hazards.

Indeed, with the assistance of the Japanese government, the country's early-warning system is being improved, but it has yet to reach down to the individual household and its evacuation procedures have not been well developed.

The process in Japan also has very long-term components aimed at shifting public thinking from fatalism to preparedness-specific "how-to" information aimed toward creating a more robust community with more knowledgeable citizens; participation in drills to raise awareness and preparedness; and promotion of greater understanding of the underlying science and technology, to encourage the authorities to address difficult public decisions, such as restriction of land uses in potentially vulnerable areas, abandonment of vulnerable facilities, or establishment of new building codes.

In Japan, for example, the nation has had full-scale earthquake preparedness drills with virtually the entire populace participating. These drills include the evacuation of structures as well as simulated post-disaster relief efforts. Similar but less massive efforts have taken place at the local level in California and in tornado-prone areas of the United States.

The role of the media is crucial in promoting the value of these test runs and in disseminating information. And in this instance, the role of newspapers, while different, is as significant as that of the telecommunications media. The written word is superior in providing detailed information such as evacuation routes or steps to take in the preparedness process. One could conceive, for example, of newspaper series or local television inserts aimed at enhancing awareness of the evolving strategies for mitigation. Why not a *This Old House* television series aimed at making midwestern U.S. homes more tornado-resistant or a series designed to enhance the earthquake resistance of residential structures of wood (California), adobe (Latin America), or stone and masonry (Italy or China)? And why can't the early warning mechanisms be coordinated, standardized, and preplanned so that there is minimal delay between the identification of an impending event and the media's dissemination of timely and coherent advice?

The matrix of natural hazards and their relationship to computer sciences and communications resources (both electronic and print media) in Figure 1 points up a far broader set of present and potential areas of linkage of the world's communications resources with hazard mitigation. Very simply, satellite observation platforms and various terrestrial, airborne, and marine sensors will play an increasingly important role in our understanding of hazardous events, and are all dependent on communications links and computer technology to be timely and effective. At the same time, the media increasingly are moving to use these tools to report on natural hazards, international turmoil, and other events. Tapping the media's capabilities can and will improve our preparedness and response to hazards. Conversely, the study and application of hazard-mitigation tech-

Figure 2: Disasters of this century, selected to represent global vulnerability to rapid-onset natural disasters.

Year	Event	Location	Approximate Death Toll
1900	Hurricane	USA	6,000
1902	Volcanic Eruption	Martinique	29,000
1902	Volcanic Eruption	Guatemala	6,000
1906	Typhoon	Hong Kong	10,000
1906	Earthquake	Taiwan	6,000
1906	Earthquake/Fire	USA	1,500
1908	Earthquake	Italy	75,000
1911	Volcanic Eruption	Philippines	1,300
1915	Earthquake	Italy	30,000
1916	Landslide	Italy, Austria	10,000
1919	Volcanic Eruption	Indonesia	5,200
1920	Earthquake/Landslide	China	200,000
1923	Earthquake/Fire	Japan	143,000
1928	Hurricane/Flood	USA	2,000
1930	Volcanic Eruption	Indonesia	1,400
1932	Earthquake	China	70,000
1933	Tsunami	Japan	3,000
1935	Earthquake	India	60,000
1938	Hurricane	USA	600
1939	Earthquake/Tsunami	Chile	30,000
1945	Floods/Landslides	Japan	1,200
1946	Tsunami	Japan	1,400
1948	Earthquake	USSR	100,000
1949	Floods	China	57,000
1949	Earthquake/Landslide	USSR	12,000-20,000
1951	Volcanic Eruption	Papua New Guinea	2,900
1953	Floods	North Sea coast (Europe)	1,800
1954	Landslide	Austria	200
1954	Floods	China	40,000
1959	Typhoon	Japan	4,600
1960	Earthquake	Morocco	12,000
1961	Typhoon	Hong Kong	400
1962	Landslide	Peru	4,000-5,000
1962	Earthquake	Iran	12,000
1963	Tropical Cyclone	Bangladesh	22,000
1963	Volcanic Eruption	Indonesia	1,200
1963	Landslide	Italy	2,000
1965	Tropical Cyclone	Bangladesh	17,000
1965	Tropical Cyclone	Bangladesh	30,000
1965	Tropical Cyclone	Bangladesh	10,000
1968	Earthquake	Iran	12,000
1970	Earthquake/Landslide	Peru	70,000
1970	Tropical Cyclone	Bangladesh	300,000-500,000
1971	Tropical Cyclone	India	10,000-25,000
1976	Earthquake	China	250,000
1976	Earthquake	Guatemala	24,000
1976	Earthquake	Italy	900
1977	Tropical Cyclone	India	20,000
1978	Earthquake	Iran	25,000
1982	Volcanic Eruption	Mexico	1,700
1985	Tropical Cyclone	Bangladesh	10,000
1985	Earthquake	Mexico	10,000
1985	Volcanic Eruption	Colombia	22,000
1987	Wildfire	China	200

Compiled from data from the Office of U.S. Foreign Disaster Assistance, National Geographic Society, K. Toki of Japan's Disaster Prevention Research Institute and the U.S. Geological Survey. Reprinted from *Confronting Natural Disasters* (Washington, D.C.: National Academy Press, 1987).

niques can enhance the quality of and interest in the services the media can provide.

In summary, the International Decade for Natural Disaster Reduction can provide a most valuable opportunity for the media and hazard specialists to work together to support mutual interests and, more important, to serve the world community by tangibly reducing the risks of natural hazards.

To do so, the media and hazard specialists must engage in predisaster planning of their own. First they should begin to develop working protocols so that they can get beyond serendipitous opportunities to a procedure that enhances the capabilities of both groups. And they should work together to develop:

◆ information of mutual benefit such as the creation of hazard maps in anticipation of likely or plausible events;

◆ data banks that can quickly provide information on the nature of a particular risk, the group exposed, the most appropriate mitigation strategies (such as evacuation routes), and the best means of conveying this information to the public;

◆ public outreach materials of interest to the media and of benefit to the general public; and

◆ plans for the deployment of sensors, whether terrestrial or earth-orbiting, capable of providing real-time data on rapidly evolving hazardous events.

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