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## USES OF THE INTERNET IN POST-EMERGENCY RESPONSE: SOME ISSUES

by

Caroline L. Herzenberg  
Argonne National Laboratory

Can the Internet be of value in post-emergency response? The answer is yes, to judge by its use following the Kobe earthquake in Japan and the ice storms in the United States and Canada last winter. This will not be a technical account of the Internet, but rather a quick look at some advantages, disadvantages, promising applications, and issues that may arise in using the Internet for post-emergency response.

The Internet and associated information technologies have already become valuable components of emergency preparedness and disaster management. So far, the Internet has probably been used most frequently in networking on a daily basis, in communicating through e-mail, and in making available general resources. Examples of these resources are the Emergency Information Infrastructure Partnership (EIIP) Website<sup>1</sup>; the Medical, Emergency, Rescue and Global Information Network (MERGINet)<sup>2</sup>; and the Natural Hazards Center Website,<sup>3</sup> to name a few. Some states, such as Pennsylvania, have networks that connect their counties into the state Emergency Operations Center. The amount of structured information on emergency management and disaster preparedness on the Internet is growing rapidly. Applications of the Internet in actual crisis situations have decreased, and experience with the Internet in actual post-disaster operations is even more limited. Much more can be done to utilize the Internet and related technologies, including geographic information systems and communications technologies, in coping with disasters. As access to and familiarity with the Internet increase, we anticipate that the uses of the Internet both in emergency preparedness and in dealing with actual emergencies will burgeon.

The Internet has been used during and following several disasters, and I'll talk briefly about how this experience has turned out in a few cases. Among the disasters in which appreciable Internet usage occurred and was written about are the Kobe earthquake in Japan and the 1989 Loma Prieta earthquake in California. In both cases, the Internet proved useful when other communications methods broke down (the telephone system largely went down in Kobe, and many of the radio and television stations went off the air in California during Loma Prieta).<sup>4</sup> The Kamsai Area Earthquake Information Web site, set up during the 1995 Kobe earthquake, is still present on the Web.<sup>5</sup> It provides an example of a Web site developed for use for a disaster; it includes government announcements; links to pages listing the deceased and survivors; damage information, including images; information on relief; mail services information; lists of out-of-service and usable phone numbers; information on Internet connections in the area; information on congregate care and relocation facilities; information from banks; railway service status; arrangements for money donation; information for volunteering; arrangements for pet care; information for blood donation; maps; local information; hospital information; and many other topics, including a message board.

A more recent example of Internet use during a crisis situation occurred during the January 1998 four-day ice storm in the northeastern United States and in Canada, which affected some 600,000 people for up to 14 days in northern New York State alone. With help from other state agencies, the New York State Emergency Management Office developed a Web page to assist in the disaster recovery, and the Internet

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also proved its worth in this disaster.<sup>6,7</sup> During the severe ice storm in the northeastern United States in January 1998, this Web page was posted with a range of useful information, such as what roads were opening up and which colleges were open for students. It also had information such as warnings about potential hazards of carbon monoxide from use of portable electric generators during the power outages. An interesting aspect of the use of the Ice Storm '98 Web site was that in many cases emergency workers and residents would go out during the day and struggle locally with the storm's effects, and then in the evening they would access the Web site and get the bigger picture of the status of the emergency.<sup>7</sup>

The Internet can provide such features as interactivity, two-way communications, and multimedia information on demand. One of its advantages is that a great deal of information can be made widely available. Access to these data can be either restricted (e.g., by password use) or open to any Internet user. The potential for dispensing information is enormous. There is also excellent potential for contacting other persons, either individually (as in e-mail) or in groups, for on-line discussions. An important aspect of the Internet is that it can provide information one-way, without permitting direct inquiries from those receiving the information. This could be an advantage for public information personnel and others responsible for information dissemination during disasters, in that they could provide information without simultaneously having to deal with a flood of direct inquiries from the media or the public.

On the other hand, the Internet does have some drawbacks. A major drawback at present is limited access. This is more of a problem world-wide than it is in the United States at present; by some estimates, about 30% of people in the United States have some form of Internet access, and this percentage is rising rapidly. To communicate or receive communications on the Internet requires literacy, knowledge of the language or languages in use, capability of using computers and software, and access to both a computer and the Internet. Also, relevant portions of the Internet must be operational: both clients and servers need to be up and not overloaded. All the communications systems that we use in emergency response, including networks, can be fragile and technically vulnerable. To compare technical vulnerabilities of the Internet with those of other communications systems, such as television, radio, telephone, cellular telephones, facsimile machines, and so on, is well beyond the scope of this paper. In crisis situations, you need redundancy; that can be accomplished by having access to many different communication channels during and after an emergency.

Another drawback of the Internet can be the presence of incorrect information. The quality of information on the Internet varies a lot, and bizarre ideas and false information have spread on the Internet in the past in other contexts. We must be prepared for this to occur during emergencies, and we will likely need some sort of rumor control operation to address rumors relating to emergencies. More generally, it would be desirable to have means to assure the integrity of information disseminated during emergencies and disasters.

While one-way electronic information dissemination may be an advantage for some applications, as just mentioned, it may also be a drawback for others. Users would have to explicitly request information that may not have been provided; they might make such requests by e-mail. (The one-way aspect of information dissemination does have the advantage that the reply can be delayed until accurate information is available.) Also, people in crisis sometimes need a direct, interactive relationship with other individuals; this need can be addressed to a limited extent by providing contact information along with the data.

The Internet has been a valuable asset in emergency management, and in the future we can expect it to become even more valuable. We can expect an increased use of computer networks during actual emergencies, for example, to support communication among emergency organizations, police, medical services, the Red Cross, and other organizations, and we can expect coordination and extension of existing state and local networks.

During a disaster, we can look forward to increased transfer of information through the Internet to and from the public and the press and among separated family, friends, and colleagues. Thus, there may be concern about traffic jams on the Internet: network traffic load. What capacity might be needed during an emergency? Could a restriction on the use of the Internet by the public be required, or even be implemented?

What about security considerations? It would appear that an increasing number of organizations may become dependent on the Internet and demand secure and efficient communications even during emergencies. Power outages can interfere with the use of computers, and Internet service providers are sometimes taken out by disasters.

Many concerns need to be addressed during the post-emergency response phase of an accident or disaster.<sup>8</sup> There would appear to be a potential for use of the Internet in conjunction with a significant number of the associated activities. Many command and control and surveillance tasks could be supported by the Internet both during and after emergencies. After emergencies, satellite communications, remote sensing images from space, and location data from global positioning system satellites will become critical to the success of emergency organizations, and these types of information can be integrated into Internet use. The global positioning system, together with geographic information systems, can be used to track the location of vehicles, ships, and other resources during emergencies and also to provide coordinates for sampling operations so that the location from which a sample originated will be known accurately and in a format suitable for use in databases.

In the post-emergency phase of a radiological emergency in which radioactive materials have been dispersed over a wide area, the gathering of samples and sample analysis will be very important. The Internet has turned out to be quite useful for communicating sample analysis results (e.g., by FTP [file transfer protocol]). In particular, if the number of samples is very large and they are being sent for analysis to several different laboratories, communication of results on the Internet and integration of results into databases will be highly important.

There are many other areas of potential Internet use. These range from communication and data management to public information to economic and legal aspects, medical and social needs, relocation needs, ingestion pathway considerations, and other areas. For example, Internet listings of evacuees or relocated persons and their locations could be helpful in reuniting families. An Internet site with information on financial assistance and legal issues following a particular disaster could provide accurate, detailed, and accessible information for individuals and businesses affected by the event.

To summarize, the Internet has many potential uses in the post-emergency response phase following a disaster, although various concerns are associated with this use, such as limited access. This brief paper has just scratched the surface of what can be done now. It is clear that we have not yet seen all of the

potential uses of the Internet, and we can look forward to new applications of what is already an extremely useful tool for emergency management.

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