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Real-Time Earthquake Data Feasible

Scientists agree that early warning devices and monitoring of both Hurricane Hugo and the Mt. Pinatubo volcanic eruption saved thousands of lives. What would it take to develop this sort of early warning and monitoring system for earthquake activity?

Not all that much, claims a panel assigned to study the feasibility, costs, and technology needed to establish a real-time earthquake monitoring (RTEM) system. The panel, drafted by the National Academy of Science's Committee on Seismology, has presented its findings in *Real-Time Earthquake Monitoring*. The recently released report states that "present technology is entirely capable of recording and processing data so as to provide real-time information, enabling people to mitigate somewhat the earthquake disaster." RTEM systems would consist of two parts—an early warning system that would give a few seconds warning before severe shaking, and immediate postquake information within minutes of the quake that would give actual measurements of the magnitude. At this time, however, this type of warning system has not been addressed at the national level for the United States and is not included in the National Earthquake Hazard Reduction Program, according to the report.

Existing seismic networks could form the basis for new RTEM systems. In these networks, data are sent to a central processing site, where hypocenters, or foci, of the quake are calculated automatically by computer. The best developed U.S. seismic networks, according to the report, are in California, but none are yet equipped to deliver real-time response data. The existing equipment, said Tom Heaton of the U.S. Geological Survey, Pasadena, Calif., and a member of the investigative panel, was designed to detect small earthquakes and uses analog, rather than digital telemetry. Therefore, even though some data can be relayed to other centers, the seismic equipment goes off the scale when shaking is strong. Some strong motion equipment is available, but it is not telemetered to any site. A combination of strong motion equipment and a telemetry system is necessary, said Heaton. Also, all equipment must be hardened to prevent failure during an earthquake.

RTEM systems would provide early warning time on the order of several seconds to areas 10 or more kilometers from the epicenter; estimates of local intensities while the earthquake is in progress, or within minutes after the quake; and rapid and reliable postquake information, which is effective in guiding rescue efforts along nondamaged roadways. Heaton said that the most useful part of RTEM systems would be alerting people to the magnitude of the quake and when the motion will begin. For larger quakes, he says there can be up to a minute of lead or warning time, and he envisions that in the future early warning systems may feature announcements, such as "shaking will begin in 5 minutes and it will be light."

Learning through their study that the technology is available or can be readily developed, the research panel concluded that "the potential benefits for hazard mitigation justify the installation of a pilot system." Their suggestion is to upgrade one of the existing (California) networks, with evaluation of its performance to monitor the system and improve as necessary.

The problem with the RTEM system, said Heaton, is a budgetary one, not a technical one. "It is frustrating to try to make any progress on the federal budget scene," said Heaton. Some funding may come from nonfederal institutions, such as Caltech, which is currently working with public utilities on postearthquake monitoring and mitigation. He is confident, however, that 20 years from now, some sort of early warning system will be in place.

For a copy of the report, contact the Board on Earth Sciences and Resources, National Research Council, 2101 Constitution Ave., N.W., Washington, DC 20418; 202-334-2000.—*Susan Bush*