STATUS OF PUBLIC EARTHQUAKE EARLY WARNING IN THE U.S.

Douglas Given

U.S. Geological Survey

Abstract

Earthquake Early Warning (EEW) is a proven use of seismological science that can give people and businesses outside the epicentral area of a large earthquake up to a minute to take protective actions before the most destructive shaking hits them. Since 2006 several organizations have been collaborating to create such a system in the United States. These groups include the US Geological Survey, Caltech, UC Berkeley, the University of Washington, the Southern California Earthquake Center, the Swiss Federal Institute of Technology, Zürich, the California Office of Emergency Services, and the California Geological Survey.

A demonstration version of the system, called ShakeAlert, began sending test notifications to selected users in California in January 2012. In August 2012 San Francisco's Bay Area Rapid Transit district began slowing and stopping trains in response to strong ground shaking. The next step in the project is to progress to a production prototype for the west coast. The system is built on top of the considerable technical and organizational earthquake monitoring infrastructure of the Advanced National Seismic System (ANSS).

While a fully functional, robust, public EEW system will require significant new investment and development in several major areas, modest progress is being made with current resources. First, high-quality sensors must be installed with sufficient density, particularly near source faults. Where possible, we are upgrading and augmenting the existing ANSS networks on the west coast. Second, data telemetry from those sensors must be engineered for speed and reliability. Next, robust central processing infrastructure is being designed and built. Also, computer algorithms to detect and characterize the evolving earthquake must be further developed and tested. Last year the Gordon and Betty Moore Foundation funded USGS, Caltech, UCB and UW to accelerate R&D efforts. Every available means of distributing alerts must be used to insure the system's effectiveness. We have developed an internet-based UserDisplay application and a smartphone app based on Google Cloud Messaging. In addition, USGS has applied for authorization to alert over FEMA's Integrated Pubic Alert and Warning System. We are also working with private companies to develop alert distribution channels and end user implementation capabilities. Finally, because policy makers, institutional users, and the public must be educated about the system, social scientists and communicators are determining how to communicate the alerts most effectively.

Progress is also being made in several related areas. Real-time GPS position data is becoming available on a large scale and algorithms are being developed to use these data to rapidly characterize the fault rupture as it propagates. New, advanced seismological and geodetic algorithms for the Cascadia megathrust and San Andreas fault are being developed. We are

exploring public-private partnerships to develop commercial EEW applications. And Federal, State and local agencies are working out their roles and responsibilities in building, operating and educating users about the system.

There is much more to be done and funding the creation and operation of this new capability is a challenge in the current budget climate. However, our goal is to build an EEW system before the next big earthquake rather than in its aftermath.