Caltech scientists developing early quake warning system imagine a smart, automatic response infrastructure

Beige Luciano-Adams, Los Angeles Newspaper Group, 9-16-11

PASADENA - The magnitude-9.0 earthquake and subsequent tsunami that devastated Japan earlier this year also left scientists anticipating a treasure trove of data from Japan's dense seismic network and GPS monitoring systems - an infrastructure in which the earthquake-prone country has invested heavily.

Japan's Meteorological Agency has also developed a sophisticated early warning system connected to that seismic network - which it successfully deployed during the March earthquake by sending messages to millions of citizens through radio, television, mobile phone and email before they felt the violent shaking.

But here in the U.S., the move toward premiering an early response system has been slower - and is about another $80 million and five years away from full development, by some estimates.

Tom Heaton, a professor of engineering seismology with Caltech, said the scientific background necessary to run an early warning system in the U.S. has been in development for more than a decade.

For the last three years scientists at Caltech have been trying to make those developments run in real time in California's seismic networks.

"Starting last winter, we had our systems develop far enough that we could actually make the system work sometimes for us. So there are about 30 scientists who have a prototype system to run in their office that let's them know waves are on their way and counts down how far until they reach them," Heaton said.

However, he added, "at this point most of the software is what I'd characterize as fragile - it crashes, there are bugs and glitches, so it's not really robust enough to release on the general society. But it's good enough to entertain the scientists."

Heaton called the question of why we trail Japan a political one - we're behind them in terms of implementation, not science, he said.

"Remember Japan is a country that has 10 times as much seismic activity as California. So the entire country is really vulnerable to a high rate of earthquake activity. If you put that kind of earthquake activity in Washington, D.C., I'm sure the U.S. would've developed a system a long time ago."

Given this country's "relatively advanced" earthquake science, Heaton said there's still a lot more we could be doing - but it boils down to a matter of priorities and resources.

"When things are seismically quiet, it hardly feels like its a priority to do all those other things. Of course when we get in the middle of a big earthquake crisis, there's always the question of why didn't we don't those other things...why don't we have better tools?"

Heaton said the early warning system is in our future - the question is really how we get there.

USGS funds the early response warning program at a rate of about $450 million a year and supports the data networks that feed it for about $10 million annually - out of an overall budget of $50 million.

"The USGS has very limited funds and many responsibilities and so its hard for USGS to commit to make a big push in early warning without added resources," Heaton said. "So with the resources we've got we can develop these systems...but we don't have nearly the resources to develop robust software to make a system that is reliable enough to automatically control things throughout society."

But that's the fun part - imagining how the system might ultimately function in society.

"What it does is it turns the earthquake into the information technology," Heaton said.

"It brings all the information available for the earthquakes while they're happening and injects it into this brave new world we're all experiencing of instant information on your smart phone."

A seismic alert "app."

But what he has in mind is more than a digital red flash on your phone; it's a broader infrastructure that will run elevators, trains, chemical plants. For example, in the event of an earthquake, the system would direct an elevator to move to the closest floor and open the doors so people don't get stuck; or direct children toward a protected part of the classroom; or slow trains to minimize damage risks - all things already under way in Japan.

But Heaton is reticent to draw a precise outline given the fluid intersection of technological development and human application.

"Japan only started using their system two years ago and the way they use it has already changed dramatically and is likely to continue changing," he said, adding that some of it will depend on human beings reacting, "but a lot of us think if it's really useful, it will be machines reacting to things automatically."