Nation's quake-warning system needs work, scientists say

April 5 2011, By Eryn Brown

Americans have been lulled into a false sense of security that they are prepared for a devastating earthquake, according to a report issued Wednesday by the National Research Council.

Among other recommendations, the report's 20-year "road map" for preparedness - which was in the works long before a magnitude 9 quake hit Japan on March 11 - calls on the U.S. to beef up earthquake research and improve forecasts and warning systems.

In California, scientists are five years into work on just the type of early-warning system the report endorses. The prototype system passed early tests with aplomb, successfully detecting the 2007 Alum Rock and 2008 Chino Hills quakes, both magnitude 5.4 temblors, before people could feel them.

But even as the federal government peruses the 20-year action plan one of its agencies commissioned, the early-warning project may be halted - because of cuts in the 2012 federal budget.

"It's not clear that they'll be able to continue funding this," said Richard Allen, a professor at the University of California, Berkeley who works on the project. "We're living on the brink, in multiple ways."

California's earthquake early-warning system, still a work in progress, depends on a network of 400 seismic stations across the state. The stations house motion-sensing instruments called seismometers that send

readings to central computers, which in turn determine when an earthquake is coming and how large it might be.

The system depends on earthquakes' emission of two types of shock waves: P waves, which don't cause violent shaking, and S waves, which do.

P waves travel twice as fast as S waves, so the computers use them to sense the shaking to come and predict an earthquake's likely size and location. Such a system could then zap warnings to end users - companies operating machinery, emergency responders and others - before the shaking begins.

If the system were developed, scientists said, Californians might receive word via television, cell phone or computer that at earthquake was coming - giving users up to "tens of seconds" of warning before destructive shaking begins, depending where a quake originates. (People living closer to the epicenter get shorter notice than those who are farther away.)

Less than a minute of warning may not sound like much. But it's enough time for transit systems to halt trains, for building operators to stop elevators or for people to move under sturdy tables, UC Berkeley's Allen said.

Just being mentally ready for warning of an earthquake could confer advantages too. "There's a huge psychological value in preparedness," said Thomas H. Jordan, director of the Southern California Earthquake Center at the University of Southern California and a member of the committee that wrote the National Research Council report. "It's one thing if someone comes behind you and hits you on the head. It's another thing if you know you're going to get in a fight."

In Japan, where a national early-warning system has been in place since 2007, seismometers successfully detected the March 11 Tohoku quake and got warnings out across the country, said Masumi Yamada, a professor in the earthquake hazards division of Kyoto University in Japan.

YouTube videos from the moments before the quake hit show trains stopping before tremors begin and warning screens popping up on computers, complete with an earthquake countdown. Yamada, who helped write the algorithms that crunch the Japanese P-wave data, said Japanese media reported that 11 bullet trains in the Tohoku region were halted by the warning system. None derailed, and there were no injuries, she said.

The system did not perform perfectly, she added: It was not able to keep up with the large number of aftershocks, and it underestimated the intensity of some of the main quake's tremors. But it has continued detecting aftershocks in the three weeks since the initial event, and it issued warnings to Tokyo when a magnitude 6.2 aftershock rattled a seismically sensitive area southwest of the city on March 15.

California's early-warning system isn't nearly as robust, scientists said. Japan is blanketed with 1,000 seismic stations. California's 400 leave many regions undermonitored.

The state's software, also, is a work in progress. "We have the algorithms up and running, but it's prototype software that's strung together with duct tape," said Egill Hauksson, a geophysicist at the California Institute of Technology. "This is nowhere close to being a reliable system."

What's more, Californians aren't as quake-savvy as the Japanese, who participate in regular drills and are conditioned to respond quickly. The National Research Council report called on American communities to

increase preparedness through "earthquake resiliency pilot projects" that would raise awareness of earthquake risk and make sure citizens have the tools to address it.

Finishing California's early-warning system would cost about $50 million and then "a few tens of millions per year" to operate, Jordan said. Compared with what's spent annually by the Department of Homeland Security - more than $40 billion - that could be a bargain, he added.

In 2008, California conducted the Great Southern California Shakeout demonstration, a pretend magnitude 7.8 earthquake that was billed as the largest disaster drill ever in the state. Computer simulations estimated that a magnitude 7.8 quake on the San Andreas fault near the Salton Sea would cause 1,800 fatalities, more than $112 billion in property damage and nearly $60 billion in business interruption.