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Op-Ed

What California can learn from the Chile, New Zealand and Japan quakes

Three countries recently shaken by devastating earthquakes have some of the most advanced earthquake engineering and safety policies in the world, and they have some things to teach Californians.

By Lucy Jones

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A little over a year ago, a magnitude 8.8 earthquake shook the nation of Chile and generated advertisement a tsunami that caused much destruction along the Chilean coast. It was the sixth-largest earthquake recorded in the last century, and it destroyed 17% of Chile's gross national product. But the earthquake and tsunami combined killed only 521 people — remarkably few.

The American Red Cross in Los Angeles and San Francisco sent a delegation to Chile to examine what enabled the Chileans to survive and recover so well. I was privileged to join this delegation, and we are now releasing a report on the lessons that California should learn from this Chilean earthquake.

In the year since the Chilean earthquake, two more devastating earthquakes have occurred, in New Zealand and Japan, bringing home many of the same lessons. The three countries where these events took place have some of the most advanced earthquake engineering and safety policies in the world, and they have some things to teach Californians.

The first lesson is that our buildings could be more earthquake resistant. The Chilean earthquake occurred under Concepcion, the second largest city in Chile, yet only a handful of engineered buildings suffered even partial collapse. The engineers we spoke to credited much of this to a law that holds the original owner of a building liable for any earthquake damage it suffers during the first 10 years after it is built, even if ownership changes during that time. Chile follows the same International Building Code as California and New Zealand, but because of the law, building owners often choose to do more than the code requires. By contrast, in California, owners have little incentive to build to higher than required standards.

The current building code in California is quite good, based on years of learning from earthquake damage worldwide. However, we have many thousands of buildings constructed to earlier standards that weren't as rigorous. In that way, our situation is akin to that of Christchurch, New Zealand, where a relatively modest magnitude 6.1 earthquake killed more than 300 people, many of them in two buildings that had been built to codes comparable to California codes of the 1980s. Incentives are needed to do more than the minimum and to improve safety in older buildings.

Another lesson is that people who live in places with a lot of seismic activity need to develop a basic

understanding of earthquake science. Many Chileans were shocked by the damage they suffered last year because they thought nothing could be worse than their 1960 earthquake, the largest ever recorded, at magnitude 9.5. But that quake struck a sparsely inhabited region, while the 8.8 quake last year hit closer to the big cities.

As any seismologist can tell you, what matters is the intensity of the shaking, and that depends on magnitude, proximity and soil conditions. One proof of this came with this year's magnitude 6.1 Christchurch earthquake, which was an aftershock to the 2010 magnitude 7.1 Darfield main shock. The Christchurch earthquake released less than one-thirtieth the energy, but it caused much greater damage because it was much closer to a city. This did not surprise scientists but stunned the mayor and other locals who never imagined that an aftershock could pose a greater danger than the main shock.

In Japan, automated seismic recording systems have been modernized to the point that they can determine that a large earthquake is underway, can estimate the areas of likely strong shaking, and can dispatch warnings to distant at-risk areas before the shaking arrives. In the recent magnitude 9 earthquake, Tokyo's televisions and cellphones received a warning more than half a minute before strong shaking arrived. Elevators moved to the nearest floor and opened, trains stopped, surgeries halted and manufacturing suspended production. The California Integrated Seismic Network (operated by Caltech, UC Berkeley, the California Geological Survey and the U.S. Geological Survey) is testing elements of a similar "early warning" prototype, but the network does not yet have the funding to implement it.

Many people who live near the coast in Chile are alive today because they knew to head for high ground the instant the shaking stopped in order to escape a tsunami. In New Zealand, one man considered running outside during the magnitude 6.1 earthquake, then remembered learning that he should instead "drop, cover and hold on." He got under a table, and from there he watched the façade of the building collapse onto the street — where he would have been standing had he not remained indoors. We need to ensure that all of our residents and visitors know what to do when an earthquake or tsunami hits.

In the end, knowledge empowers us. We all need to know what to do during an earthquake, so we make choices that give us a safer California.

Lucy Jones is a seismologist with the U.S. Geological Survey in Pasadena. The report on the lessons of the Chilean earthquake can be seen at <http://pubs.usgs.gov/of/2011/1053>

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