California Earthquake Authority

Trust Based on Science and Reinforced Through Communication
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The history of CoreLogic® and the California Earthquake Authority (CEA) reaches back to before the CEA began offering earthquake insurance in 1996. After the magnitude 6.7 Northridge earthquake in 1994 resulted in heavy insurance losses, the CEA was established as an acceptable compromise between the insurance industry and the state of California. Property insurance providers, who at the time were required to offer earthquake insurance with residential homeowner policies, had begun leaving the California market. To stem the market exodus, the California Legislature created the CEA in 1996 as a publicly managed, privately funded not-for-profit entity to provide residential earthquake insurance, mitigate residential earthquake risk, and educate Californians on how to minimize earthquake losses.

**Earthquake-Science Standards Mandated by Law**

One of the first tasks of the newly formed insurance entity was to set rates based on a property’s level of risk. Different from private carriers that can choose which risk model to use when setting policy rates, the CEA operates under a law that mandates strict standards for rate-setting science:

> “Rates shall be established based on the best available scientific information for assessing the risk of earthquake loss.”

**CALIFORNIA INSURANCE CODE § 10089.40**

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Tim Richison, chief financial officer for the CEA, was part of the original rollout team, “The CoreLogic team was the first to understand our coverage and our needs,” says Richison. “And they haven’t let us down since.”

In addition to the model, Richison relies on the expertise CoreLogic offers, “I’ve been challenging,” says Richison, “I ask a lot of questions because, to do my job well, I feel it’s important to understand the science and data that go into creating earthquake models. I must say that every question I’ve asked of CoreLogic has been answered—fully. I’ve spent hours talking to the team, and their explanations are always straightforward and clear.”
Updated UCERF Science Raises New Questions on Risk

In 2013, the Working Group on California Earthquake Probabilities (WGCEP) released its third version of the Uniform California Earthquake Rupture Forecast (UCERF3). CoreLogic was among the first of the catastrophe risk modeling vendors to incorporate the new UCERF3 science in its U.S. Earthquake Model in June of 2016. Outside of California, the 2014 U.S. Geological Survey (USGS) National Seismic Hazard Model forms the basis of the hazard for the remainder of the continental U.S. In addition to new ground-motion prediction equations and site-amplification factors and site conditions, the CoreLogic model includes four features critical to insurance providers:

- Earthquake-induced liquefaction
- Earthquake-induced landslide
- Deep sedimentary-basin response
- The option of both time-dependent and time-independent frequency models

PROPAGATION OF HAZARD TO SITE

The U.S. Earthquake Model from CoreLogic combines advanced GIS mapping technology and soil-type data with USGS and UCERF3 hazard science to establish loss models for specific sites.
The California portion of the model incorporates the scientific community's evolving awareness of earthquake dynamics within California's complex fault system.

That interconnected nature led the team of UCERF3 scientists to understand that a significant rupture on one California fault segment can connect to other faults and fault segments. Events of the past few years—including New Zealand's 2010 magnitude 7.1 Darfield earthquake near Christchurch, Japan's 2011 magnitude 9.0 Tohoku-oki earthquake, California's 1992 magnitude 7.3 Landers earthquake, and other ruptures known to have occurred along multiple faults—have demonstrated that fact.

Applying this new understanding to California required scientists to remove the UCERF2 assumption that a rupture happens on just one fault or fault segment. In other words, UCERF2 set parameters for how earthquakes behave. UCERF3 removed those artificial constraints.

Kenneth W. Campbell, Ph.D., director of model development for CoreLogic, is among the world's leading earthquake hazard scientists. He explains the difference between UCERF2 and UCERF3 in terms of modeling methods. “Rather than starting with set parameters, as UCERF2 did, UCERF3 starts with the seismic moment (seismic energy) and from that derives the model parameters. It turns out to be a very valuable way of looking at seismic hazard. And it results in a model that has a much better fit to California's historical record.”

Using the example of a magnitude 8.3 rupture along the San Andreas fault, UCERF 3 science shows that the areas of damage increase significantly and can simultaneously impact Northern and Southern California. This example illustrates the difference in the number of homes damaged in the two versions of the model.
This next-generation approach brought about important new findings, which include the following:

► There is a higher frequency of events less than magnitude 6.0, but those events generally cause very little damage.
► There has been a decrease in the frequency of magnitude 6.5-7.5 earthquakes, which decreases the average annual loss (AAL), as these are the events that contribute most to that loss level.
► There is an increased frequency of earthquakes greater than magnitude 7.5 and these event footprints are larger than previously anticipated.
► Because of the potential of multiple segment rupture, this means there is a greater probability that an event will cause loss in both Northern and Southern California simultaneously—a concept that was always thought to not be possible.

Just as the UCERF3 science required CoreLogic modelers to shift their perspective on California’s earthquake risk when incorporating the science into the company’s new risk models, it is also requiring insurers and reinsurers to make a similar shift in thinking about and managing earthquake risk. For the CEA, other insurers, and reinsurers, the change also requires rate and reinsurance changes to accommodate this new understanding of risk.

**Incorporating Science Into Business**

Though the CEA provided funding for developing the UCERF3 hazard model, the impact on losses came as a surprise when UCERF3 was implemented into the risk model.

“This is where good communication is so valuable,” says Richison. “Ken [Campbell] and his team have done an excellent job of explaining how they incorporated the UCERF3 science into their earthquake model and the other updates they’ve made to their models. My challenge has been in accepting UCERF3’s impact on losses.”

Ken Campbell’s extensive experience and understanding of earthquake science proved vital to overcoming that hurdle. But just as someone might accept a difficult medical diagnosis, looking ahead to the changes it will bring is never easy.

“We’ll need to revisit coverage and rates throughout the state,” says Richison. “And we’ll need to increase our reinsurance amounts at the aggregate level.”

Richison has established a very sophisticated process for reinsurance that allows the CEA to stagger purchase dates over years, so that contracts expire at different times. He also purchases reinsurance from providers in more than a dozen countries and has plans for expanding that geographic reach. The system Richison developed allows the CEA to spread risk and purchase additional reinsurance on an as-needed basis.
A Process Worth Replicating

As a leading earthquake insurer, the CEA offers a proven roadmap for insurers and reinsurers:

► Stay on top of and open to the latest earthquake science.
► Establish a solid and open relationship with a trusted earthquake model provider.
► Ask plenty of questions of your model vendor and make sure you get them answered fully so that the actions you take are founded on understanding.
► Unflinchingly apply the models to assess risk, set rates, and establish reinsurance needs.

Insurers who follow a similar process agree with this approach. “One of the greatest threats in catastrophe insurance is the unknown, and some of the most devastating events in our industry have caught us off guard,” says Jim English, a catastrophe risk analyst for ICW Group, a large commercial earthquake insurance provider based in San Diego, California.

“Tohoku wasn’t supposed to be possible, and neither was the extent to which soil liquefied in Christchurch,” says English. “There are always going to be unknowns in our field, but the balance between what is known and unknown is constantly shifting in our favor. While there’s only so much we can do to prepare for the unknown, it would be careless to ignore new information as it becomes known to us.”

Earthquake Risk Affects Multiple Industries

Just as recent earthquakes and UCERF3 science reveal that earthquakes don’t stay within geographic boundaries, it’s clear from events like Japan’s Tohoku-oki earthquake that a single event can affect multiple industries. Companies that provide catastrophe insurance certainly benefit from incorporating the latest earthquake science into their risk assessments and planning, but insurers and reinsurers that cover renters, vehicle, marine, and commercial property could also benefit. Beyond the insurance industry, modeling to increase understanding of earthquake risk could provide critical insight to risk managers in industries that include mortgage, mining, and oil and gas, as well as public agencies involved in planning and emergency response.