

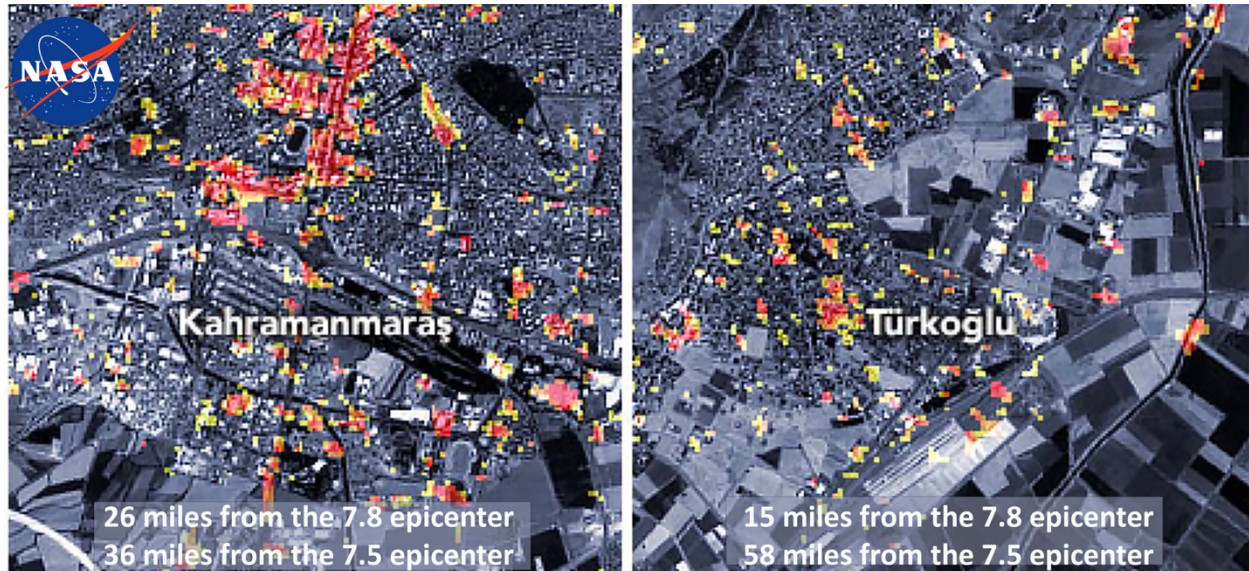
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Not My Fault: Earthquakes don't end when the shaking stops

Lori Dengler for the Times-Standard

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Damage proxy maps of two cities prepared by NASA's Jet Propulsion Laboratory and Caltech from before and after comparisons of satellite imagery. Dark red areas are likely to have experienced severe damage while areas in orange and yellow are partially damaged (<https://earthobservatory.nasa.gov/images/150949/earthquake-damage-in-turkiye>).

It's been nearly two weeks since the great earthquakes near the Turkey – Syria border. It's still front-page news featuring jarring photos of buildings reduced to rubble and interviews with those that barely survived. Each day the death toll continues to climb and currently stands at over 45,000 and at least 122,000 injuries. I am sure those numbers will rise.

For the survivors, the earthquake has only just begun. The actual shaking lasted less than a minute. Forty seconds of strong motion seems like an eternity, but it is a mere instant in the full scope of earthquake disasters. Many are displaced from homes in the dead of winter. Even people who still have homes have lost their livelihoods and are dependent upon relief efforts. What happens next is largely a function of the efforts put in place in the years and decades before the rupture started.

I always began my natural disaster class at Humboldt with a graphic depicting the disaster cycle - a circle with the event (flood, hurricane, earthquake etc.) at the top. Moving clockwise is response, assessing what happened and fighting fires, rescuing people, securing damaged areas and so forth. The response phase merges into relief efforts (providing medical care, food/water, shelter, and other basic needs).

Response and relief occur in the hours and weeks immediately following a disaster and get the most media attention, but it's the next part of the circle that determines the survivability of a community and how it will fare in the next disaster. Recovery rarely provides photo-ops that make headline news but it's the phase that restores communities to functioning, self-sustaining societies. It starts with clearing debris and restoring infrastructure and continues with rebuilding structures and the economy. For major disasters, the recovery phase is costly and can last for decades.

In a perfect world, recovery should always take place within a framework of mitigation. Mitigation is the least glamorous of the disaster phases and my favorite. Mitigation includes all the efforts that create a more resilient community – from “hard” mitigation using engineering solutions to build more resilient structures and control development in risky areas, to what I call “smart” mitigation, educating the community and decision makers about the hazard and sustaining disaster planning efforts.

The mitigation phase determines the fate of a community when the next storm, earthquake, tsunami, or other disaster strikes. If I draw my disaster cycle circle to scale, it will occupy the majority of the space. It may be decades to centuries before a similar event strikes again. The more time that elapses, the harder it becomes to keep up our guard, continuing to enforce more expensive construction practices, zone certain areas as off limits to development, or maintain disaster response planning and exercises.

Let me focus on Turkey. I was fortunate to visit Turkey in 2015, attending a tsunami symposium and adding on a week to sail the southwestern coast. It is beautiful and not as different from California as you might think. Turkey has no excuse to not prioritize earthquake mitigation. NOAA's National Centers for Environmental Information lists fifty earthquakes with 1000 or more fatalities in Turkey's history. The 1999 M7.5 Izmit earthquake in the northwestern part of the country claimed at least 17,000 lives.

The Izmit earthquake triggered numerous efforts to improve seismic resilience. Only three months after the earthquake, Turkey imposed an Earthquake Tax with the aim of retrofitting weaker structures and improving disaster response. Initially a temporary levy on communication systems such as cable TV and mobile data, it became permanent in 2003.

We know that response has been slow. By definition, a disaster is an event that overwhelms local resources and requires regional, national, or international assistance. As a member of the European Union Turkey had agreements in place to facilitate international assistance. We don't yet know where the sticking points were and what impeded those efforts.

Turkey adheres to the International Building Code that requires the same resistance to shaking as those in California. The public is well aware of earthquake hazards, and some are willing to pay a premium for structures advertised as “earthquake safe.” Unfortunately, some collapsed (New York Times 2/13/23).

We don't know how many structures collapsed, how recently they were built and what caused damage. International teams of engineers are only just now being allowed entry and it will take

months for thorough assessments. Claims of contractor malfeasance have been made and over 130 are under investigation by the government (Washington Post 2/12/23).

Pointing at contractors may provide a convenient scapegoat, but if corners were cut in construction, government officials must also bear some of the blame. Anyone who has ever built or remodeled a structure in California knows the onerous process of building inspections. This includes assessing concrete quality, rebar density, welds, and joints. Constructing a bad building has no single villain - it means inadequate oversight.

With all of the damage, it is easy to ignore the successes. I recently participated in the USGS Northern California Earthquake Hazards Conference. David Applegate, the Director of the USGS, commented in his opening remarks, "Don't ignore the dog that didn't bark." He meant pay attention to the successes and learn from them.

There were successes in Turkey. The majority of the structures in the strong to severe shaking areas did not collapse. NASA and Caltech's Jet Propulsion Laboratory has processed before and after satellite imagery to map out the pattern of damage in the epicentral area. The deep red and orange heavily damaged areas catch your eye, but most of the images are in shades of gray where the damage was not profound.

One success may be base-isolation systems. Turkey mandates base-isolation dampening for medical facilities in strong shaking zones. Four hospitals with these systems that allow the building to remain still while the ground shakes violently were undamaged in the recent earthquakes (<https://www.hurriyetdailynews.com/seismic-isolation-devices-prevent-damage-in-four-hospitals-180830>). The Turkey-Syria earthquake may provide the best evidence yet on how well base-isolation systems perform.

Here's to all the dogs that didn't bark.

Lori Dengler is an emeritus professor of geology at Cal Poly Humboldt and an expert in tsunami and earthquake hazards. The opinions expressed are hers and not the Times-Standard's. All Not My Fault columns are archived online at <https://kamome.humboldt.edu/resources> and may be reused for educational purposes. Leave a message at (707) 826-6019 or email rctwg@humboldt.edu for questions and comments about this column, or to request a free copy of the North Coast preparedness magazine "Living on Shaky Ground."