

# The “AfterMap” of the February 2023 Earthquakes in Türkiye

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*In this first-person narrative, I explore the ethical challenges encountered while providing mapping support in the aftermath of the February 2023 earthquakes in Türkiye, a disaster that impacted 2.65 million people across several major cities. This crisis underscored the essential role of geospatial data in disaster response, while also exposing the disparities in data access and representation globally. Many vulnerable communities lack the resources needed to benefit equally from these efforts, leaving a critical gap often addressed by volunteer organizations.*

*Through our collaboration with the Humanitarian OpenStreetMap Team, my students and I engaged in digitizing essential map data, witnessing firsthand its transformative effect on disaster response. Despite the inherent challenges and uncertainties in volunteer mapping, each contribution plays a vital role in bridging spatial data gaps and enhancing resilience against natural disasters. This collective effort, following in the footsteps of former collaborative mapping efforts, highlights the importance of collaborative action in crisis mapping.*

*By sharing this experience, I aim to shed light on the inequalities present in disaster situations and advocate for more equitable and inclusive approaches to disaster relief. Providing accurate information about unmapped areas and their needs can help pave the way for fairer distribution of aid. As environmental hazards grow more frequent and severe, the insights from this reflection on our mapping journey offer valuable perspectives on equity in digital cartography, with the potential for significant societal benefits.*

**KEYWORDS:** disaster mapping; equity; GIS volunteers; disaster response; cartographic ethics

## BACKGROUND

AS A MAPMAKER AND MAP USER, I HAVE ALWAYS ADMIRING how technology enhances our ability to represent the world and support spatial decision-making. However, while geographers have historically focused on the spatial representations enabled by these technologies, it has not always been from a critical perspective (Roberts and Schein 1995). Similar to geographers, GIScientists and/or GIS practitioners do not always adopt a critical stance on the representation of space (and are perhaps rightfully being criticized for this). But there is nonetheless a substantial literature and research underscoring the importance of the subject.

Critical mapping and GIS have been a key area of research for more than a decade, extensively discussed and revisited by scholars such as Pickles (1995), O’Sullivan (2006),

Crampton (2010), Denis Wood (1993), Michael Wood (2001), Thatcher et al. (2016), Harvey et al. (2005), and Edney (2015), with Blomley (2006) providing a comprehensive review of critical geography. In particular, Crampton (2010) notes that critical mapping examines the relationship between knowledge and power. The way we acquire and validate knowledge is deeply influenced by power dynamics, and certain ways of knowing are privileged or given more legitimacy because of the power structures that support them. This suggests that what we come to “know” is influenced by these power relationships, rather than being purely objective or universal.

While I acknowledge and appreciate these significant research efforts, my paper does not aim to review them but instead presents a personal case study that focuses



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on power dynamics and inequalities in technology access during disaster response, and the ethical considerations that come from these inequalities.

These power dynamics were particularly evident on February 6th, 2023, when two devastating earthquakes struck Türkiye, severely affecting millions and exposing the disparities in disaster response, and in the knowledge that underpins it. On February 6, 2023, at 4:17 AM local time, a devastating magnitude 7.8 earthquake struck southern and central Türkiye, as well as northern and western Syria. Less than ten hours later, the impact of another powerful quake, with a magnitude of 7.7, added to the already ravaged geography (Meng et al. 2024). These numbers are among the few certainties regarding this catastrophic event. Numerous uncertainties persist to this day, particularly concerning the extent of human casualties and economic losses. These uncertainties are exacerbated by power differences that limit our knowledge.

In disaster mitigation, GIS is often used to map and assess risk areas, identify vulnerable populations, and plan emergency responses. Typically, urban areas are prioritized in these analyses due to their higher population density, infrastructure, and economic importance. While rural areas are often equally or even more vulnerable to certain disasters, such as earthquakes, wildfires, or floods, they frequently receive less attention in disaster mitigation efforts. GIS data in these regions may be sparse or outdated, and contain less information about the landscape, infrastructure, or local populations.

During a disaster, urban areas may have well-established evacuation plans and response teams, while rural communities might lack timely warnings or adequate evacuation routes. Besides an underinvestment in GIS data, rural communities may also have insufficiently trained personnel, and a lack of accessible emergency information, all of which compounds the disastrous effects of a catastrophe such as an earthquake.

This imbalance illustrates how power dynamics, reflected in the distribution of spatial data, can influence disaster preparedness and response across the urban-rural and developed-underdeveloped divide. When the earthquakes struck, I realized the critical role mapmaking could play in alleviating some of the inequalities I witnessed, particularly in filling the missing pieces in crowdsourced disaster mapping, which will be expanded later in the paper.

In an era when the spread of information is, surprisingly, **faster than the propagation of seismic vibrations**, can we expect a similar rapid dissemination of news about earthquake-affected communities? During the 2010 Haitian earthquake, the humanitarian field staff encountered significant difficulties due to unreliable information about health facilities, demographics, and infrastructure. The constantly shifting situation required ongoing processing of new data to grasp the evolving events which underlined the necessity of a system to gather all the information which is important for decision making (Harvard Humanitarian Initiative 2011). During this crisis, the **Ushahidi project** was deployed to give meaning to the information acquired by processing big data (in the form of SMS reports) coming through crowdsourcing (Mora 2011). While it wasn't exactly as fast as seismic waves, this crowdsourcing effort improved the spread of important information.

However, while technological advancements are universally influencing societies and pushing them toward similar outcomes, the speed at which different areas adapt and reach this technological "destination" varies, even though they are all moving in that direction (Wood 2001).

When the earthquakes struck eight major cities and provinces (Adana, Kahramanmaraş, Osmaniye, Hatay, Malatya, Adıyaman, Gaziantep, and Kilis) in southeastern Türkiye, more than 2.65 million people were living within a 50-kilometer radius of the first earthquake's epicenter. According to the Turkish Statistics Institute (Türkiye İstatistik Kurumu 2023), the proportion of households with high-speed internet access (e.g., through a digital subscriber line, cable, or fiber) for the Mediterranean Region (along the Mediterranean Sea in southern Türkiye where Adana, Kahramanmaraş, Osmaniye and Hatay are located) is 58%, and for the Southeast Anatolia Region (along the Syrian border where Malatya, Adıyaman, Gaziantep and Kilis are located) it is 43%. In the 2023 earthquakes, in which thousands of buildings collapsed and hundreds of thousands more were damaged, household fixed broadband access also collapsed. Mobile internet access (with 90% access for the Mediterranean Region and 92% for Southeast Anatolia) was also disrupted, as evidenced by the many complaints to the primary telephone service providers about disconnections (Sarp Nebil 2023). Additionally, social media users complained about internet disruptions, and officials announced that mobile bandwidth limitations were being applied in the regions affected by the earthquakes. All of these factors resulted

in a significant portion of the population having faulty or no internet access with which to announce their urgent needs, thus leading them to remain underrepresented and unseen. This situation underscores the glaring need for a more comprehensive data infrastructure (particularly

locational), which, regrettably, remains absent in Türkiye and in many other parts of the world. Locational data and disaster maps play a pivotal role in disaster management and response, and it is imperative that they accurately and inclusively represent the individuals affected.

## MY RESPONSE

AS A TURKISH CITIZEN, I GRAPPLED WITH A RANGE of unsettling emotions in response to the February 6 disaster. I knew that in times of crisis, like what had just happened, there is immense pressure to rapidly produce maps and allocate resources to aid relief efforts. How could I use my mapmaking skillset to aid those who were waiting for help? What was my responsibility as a person with experience working on this type of mapping for the past decade? How could I channel my own capacity, my network, and our resources to make a significant contribution in this time of need? These thoughts occupied my mind as I contemplated how to aid relief efforts from the safety of my home, thousands of miles away from the harsh realities faced by those in distress. In my emotional turmoil, I honestly wasn't sure where to start. The only thing I knew was that I wanted to help the relief effort.

Persisting through the failure of communication networks, people desperately sought help for themselves and their loved ones. Social media became inundated with pleas for assistance. Some of these posts included addresses and other locational information. My first approach was to scrape the social media data by writing a couple of scripts to get location information from the text and images that could then be used in rescue operations. Then I saw that a lot of other people had the same idea and were making their scripts available on GitHub. Despite the substantial effort put into this approach, I couldn't help but question how accessible the results of these efforts were to those attempting to provide aid and relief. I also wondered: Were we merely contributing to another layer of noise in the vast data landscape? What about the people with limited or even no access to the internet in the first place? My concerns were amplified by the fact that it wasn't possible to validate the data, and it was even more difficult to authenticate where and how it was produced. Locational data serves as the backbone of any disaster management effort, yet it paradoxically stands as one of the most unreliable and unavailable elements in this process.

I continued to question how equity could be ensured so that rescue maps could be created in ways that were fair

and inclusive for all individuals. I felt unsettled in my efforts, until it dawned on me that perhaps I would have more impact in a collaborative effort rather than a solo one. As soon as I saw **the call made** by UN Mappers—a community of mappers collaborating to collect, validate, and disseminate geospatial open data to support United Nations field operations—for collaborative mapathon sessions to create maps to aid the disaster relief (Figure 1), I realized that the best possible way forward for me

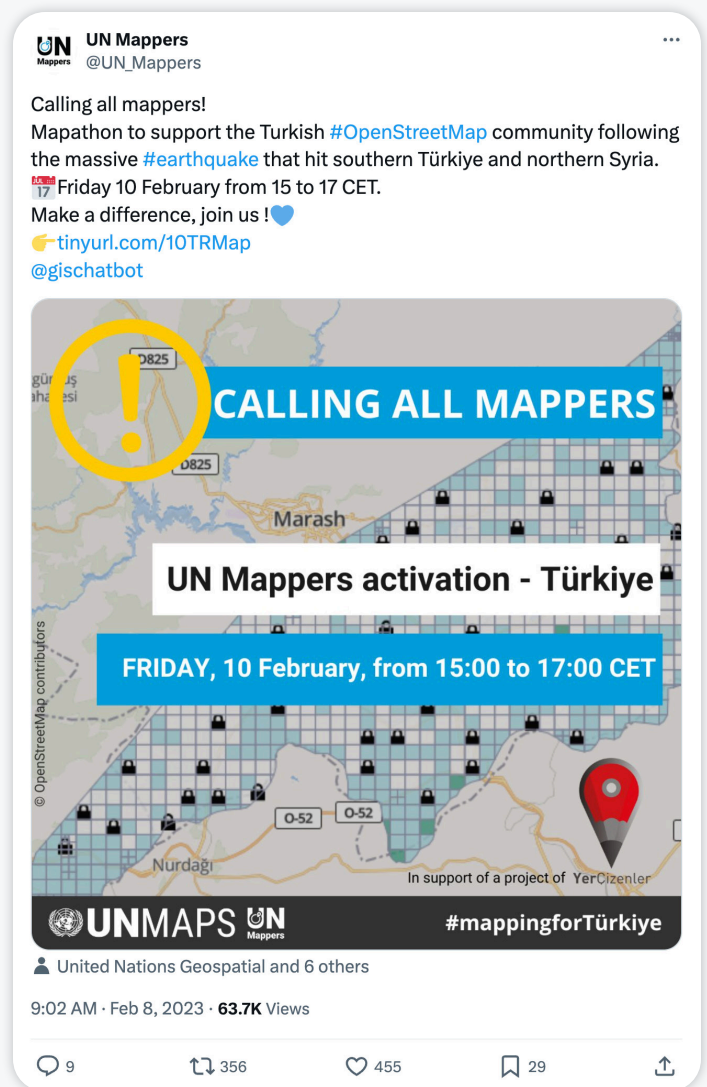


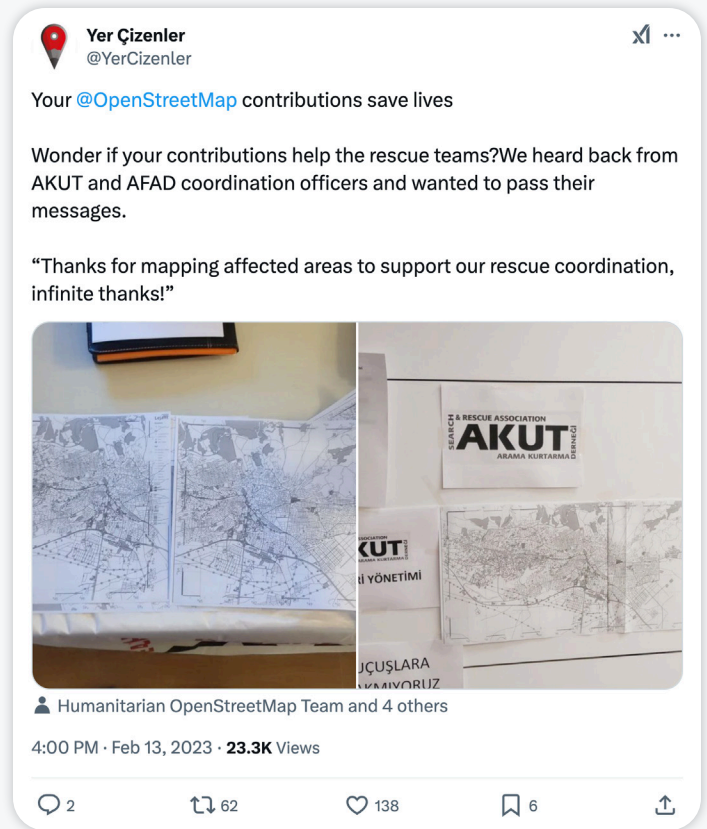
Figure 1. Call for a mapathon to aid the HOT OSM earthquake disaster relief efforts in Türkiye.

was to go back to the simplest way to help: I joined the [Humanitarian OpenStreetMap Team](#) (HOT) effort. HOT is an international volunteer-based team that provides open and free map data for humanitarian aid and economic development. Individuals or organizations can create mapping projects for areas where map data is needed to help save or improve lives. Immediately after the February 2023 earthquakes, projects were set up to focus on affected regions where critical map data layers were not available.

Though I have taught about the accessible and collaborative nature of OpenStreetMap (OSM), and I have created OSM exercises for my students, I had never really rolled up my sleeves and contributed to it significantly. So, that is what I decided to do. Instead of doing it alone, I also recruited the students who were taking my WebGIS class during the spring term at the University of Massachusetts Amherst. I additionally reached out to former students who were members of my GISynchopation Slack channel. I posted and reposted as much as I could through social media about what we were doing to encourage others to also participate.

My current and former students and I dedicated hours to digitizing roads and buildings outlined in [HOT project #14226](#): M7.8 Earthquake Türkiye – Gaziantep Response. We meticulously traced features from Mixar Premium satellite imagery or verified AI-assisted mappings generated by a tool known as [Rapid](#). Making those small edits to polygons and lines for hours in front of a screen wasn't the most sophisticated work that I have done during my career, but it made me feel like I was at least helping. Then, when we witnessed the effect that our contributions had on damage assessment and relief planning, the gratification we felt made everything worth it.

For instance, in [a tweet by Yer Çizenler](#), a Turkish non-government agency that supports the use of free and open geospatial data in humanitarian endeavors, our maps were shown in two images from the AKUT Search and Rescue Association (Figure 2). These photos illustrate how AKUT used our contributions for field coordination, to



**Figure 2.** A tweet from Yer Çizenler shows two of our maps that were being used by AKUT.

reach damaged buildings, and to conduct needs assessments. In [an online article](#) about the mapping response to the Türkiye and Syria earthquake, HOT noted how many buildings had been mapped:

Promptly after the earthquake hit, organizations like the International Federation of the Red Cross/Red Crescent (IFRC) requested building-level vector data for post-disaster damage assessments from Yer Çizenler, the coordinator of the response. Using government data, a Copernicus damage analysis, and pre-disaster OSM building footprints (more than 1.6 million have been mapped through today via the HOT Tasking Manager), IFRC performed a geospatial analysis to help them plan their aid in relief and recovery efforts by pinpointing the exact location of each destroyed building.

## CONCLUSION

UNDERSTANDING THE TANGIBLE IMPACT OF OUR work has been pivotal for me. Even though I had used

OSM previously, I have never really felt that my work had such a concrete impact. Did my efforts truly make the

unseen visible? Did I help to give a voice to the unheard? Was I able to add equity to the response efforts? While the answer may still be uncertain, these questions drive me to continue striving for a resounding “yes.”

The volunteer GIS and crowdsourcing concepts have been around for very long time (Goodchild 2007), yet there is still much room for improvement in disaster response, and I harbor doubts that there would be any significant differences were a similar catastrophe of the same scale happen today in the same geography. However, as I reflect on the events surrounding the February 2023 earthquakes and their aftermath, I am reminded of the profound effect that volunteered geographic information can have on crisis response. This means we will repeat what has been pioneered in disaster response—including by [Ushahidi project](#), in Russia during the wildfires in 2010, in the January 2010 Haiti and February 2010 Chile earthquakes, and many more—collaborative work to create the data and become the sensor of people who are invisible on the map.

The challenges faced in rapidly producing meaningful maps, coupled with disparities in broadband accessibility,

underscore the critical need for a comprehensive and inclusive approach to disaster relief efforts. My experience with HOT reaffirmed the importance of community collaboration and the role of education in preparing individuals for such crises. I feel that we need to engage in more collaborative mapping efforts and perhaps not wait until a disaster hits. I advocate for sustained collaboration and proactive utilization of technology for societal good.

I have also learned that, as mapmakers, we bear a responsibility to advocate for those who might otherwise go unnoticed. In this case, they were the residents of rural parts of Türkiye who might have waited several days or even months for their locations to be mapped. As we continue to face the complex challenges of disaster response, I find solace in the collective power of communities volunteering their time and expertise, and the potential of technology to bridge gaps and bring about positive change.

The community’s collectively created data on destroyed buildings is [available for download](#).

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since the moment I first heard about the event. Above all, I wish to express my profound respect and sympathy to those who lost their loved ones during the earthquake. Your resilience and courage serve as a constant inspiration, propelling our collective efforts towards fostering a more equitable world for all.

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## REFERENCES

- Blomley, Nicholas. 2006. “Uncritical critical geography?” *Progress in Human Geography* 30 (1): 87–94. <https://doi.org/10.1191/0309132506ph593pr>.
- Crampton, Jeremy W. 2010. *Mapping: A Critical Introduction to Cartography and GIS*. Chichester, UK: Wiley-Blackwell. <https://doi.org/10.1002/9781444317411>.
- Edney, Matthew H. 2015. “Cartography and its Discontents.” *Cartographica* 50 (1): 9–13. <https://doi.org/10.3138/carto.50.1.02>.
- Goodchild, Michael F. 2007. “Citizens as sensors: the world of volunteered geography.” *GeoJournal* 69: 211–221. <https://doi.org/10.1007/s10708-007-9111-y>.
- Harvey, Francis, Mei-Po Kwan, and Marianna Pavlovskaya. 2005. “Introduction: Critical GIS.” *Cartographica* 40 (4): 1–4. <https://doi.org/10.3138/0416-2314-6068-43v6>.
- Harvard Humanitarian Initiative. 2011. *Disaster Relief 2.0: The Future of Information Sharing in Humanitarian Emergencies*. Washington, DC and Berkshire, UK: UN Foundation & Vodafone Foundation Technology Partnership.

- Meng, Jiannan, Timothy Kusky, Walter D. Mooney, Erdin Bozkurt, Mehmet Nuri Bodur, and Lu Wang. 2024. "Surface deformations of the 6 February 2023 earthquake sequence, eastern Türkiye." *Science* 383 (6680): 298–305. <https://doi.org/10.1126/science.adj3770>.
- Mora, Fernando. 2011. "Innovating in the midst of crisis: A case study of Ushahidi." [https://www.researchgate.net/publication/231537244\\_Innovating\\_in\\_the\\_midst\\_of\\_crisis\\_A\\_case\\_study\\_of\\_Ushahidi](https://www.researchgate.net/publication/231537244_Innovating_in_the_midst_of_crisis_A_case_study_of_Ushahidi).
- O'Sullivan, David. 2006. "Geographical information science: Critical GIS." *Progress in Human Geography* 30 (6): 783–791. <https://doi.org/10.1177/0309132506071528>.
- Pickles, John, ed. 1995. *Ground Truth: The Social Implications of Geographic Information Systems*. New York: The Guilford Press.
- Roberts, Susan M., and Richard H. Schein. 1995. "Earth Shattering: Global imagery and GIS." In *Ground Truth: The Social Implications of Geographic Information Systems*, edited by John Pickles, 171–195. New York: The Guilford Press.
- Sarp Nebil, Füsün. 2023. "Telefon operatörlerimiz depremde ne yaptılar?" *T24 Bağımsız İnternet Gazetesi*. February 28, 2023. <https://t24.com.tr/yazarlar/fusun-sarp-nebil/telefon-operatörlerimiz-depremde-ne-yaptılar-ii-turkcell,38916>.
- Thatcher, Jim, Luke Bergmann, Britta Ricker, et al. "Revisiting critical GIS." *Environment and Planning A: Economy and Space* 48 (5): 815–824. <https://doi.org/10.1177/0308518X15622208>.
- Türkiye İstatistik Kurumu [Turkish Statistical Institute]. 2023. "Hanehalkı Bilişim Teknolojileri (BT) Kullanım Araştırması [Household Information Technologies (IT) Usage Survey, 2023]". Table: İstatistiki Bölge Birimleri Sınıflaması 1. Düzey'e Göre Hanelerde İnternet Erişim Oranı [Internet Access Rate in Households According to Statistical Regional Units Classification Level 1]. Accessed May 6, 2024. [https://data.tuik.gov.tr/Bulten/Index?p=Hanehalki-Bilisim-Teknolojileri-\(BT\)-Kullanim-Arastirmasi-2023-49407](https://data.tuik.gov.tr/Bulten/Index?p=Hanehalki-Bilisim-Teknolojileri-(BT)-Kullanim-Arastirmasi-2023-49407).
- Wood, Denis. 1993. "The fine line between mapping and map making." *Cartographica* 30 (4): 50–60. <https://doi.org/10.3138/n70q-0r5x-694t-7868>.
- Wood, Michael. 2001. "The 21st Century World – No Future Without Cartography." *Journal of Geospatial Engineering* 3 (2): 77–86.

