



TAIWAN-REYHANLI CENTRE FOR WORLD CITIZENS

Earthquake and conflict-driven impacts on the Türkiye-Syria border

Reyhanlı, a municipality and district of 367 km² in Hatay province in Türkiye, lies ~50 km west of Aleppo and hosts the busiest land border crossing between Türkiye and Syria. A key challenge for Reyhanlı is the support and peaceful integration of thousands of refugees that crossed the border due to the Syrian refugee crisis from 2011, and again following the earthquakes of February 2023. The population of Reyhanlı grew from 120,000 to 270,000 between 2011 and 2023, and to 390,000 after the 2023 earthquake.

In February 2023, a sequence of earthquakes struck southern and central Türkiye and northern and western Syria. More than 84,000 buildings collapsed or were severely damaged, and more than 50,000 lives were lost in Türkiye and Syria [1]. The first earthquake, a Magnitude 7.8 on 6 February at 04:17 local time, with an epicentre 110 km to the north-northeast of Reyhanlı, caused the largest shaking. Modified Mercalli Intensity (MMI) shaking of 7.0-7.5 was felt in Reyhanlı, with subsequent earthquakes causing MMI shaking of up to 5.5 in the town [2] (Figure 1). Of the 11 earthquake-affected provinces in Türkiye, **Hatay province had the greatest reported impact, with over 22,000 people killed, c.1,456,000 people displaced, and nearly 334,000 buildings damaged** (56% of the total) [3]. Reyhanlı itself was less badly damaged than Antakya and Kirikhan districts in Hatay, meaning that it became a hub for shelter and recovery from both sides of the Türkiye-Syria border.

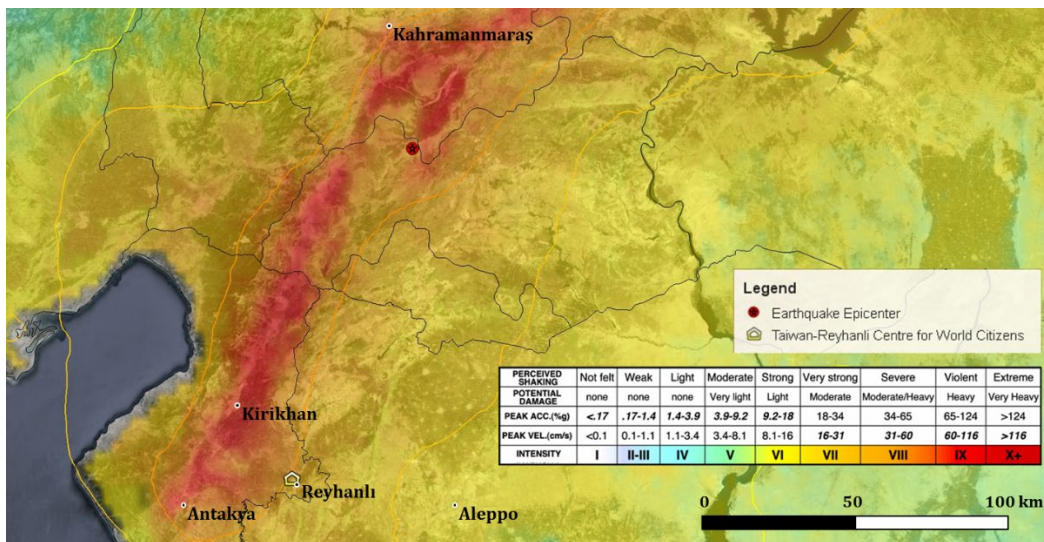


Figure 1: MMI shaking associated with the Magnitude 7.8 earthquake of 6 February, 04:17 local time. ShakeMap data [2], plotted in Google Earth. District and country borders are marked in grey.

THE INTERVENTION: From refugee community centre to humanitarian relief centre

The idea to build the Taiwan-Reyhanlı Centre for World Citizens was triggered by the Syrian civil war, which required Reyhanlı to absorb more than 150,000 Syrian refugees into a town of 120,000 Turkish residents. The Centre aimed to improve socio-cultural integration and inclusion between Syrian refugees and Turkish locals, with a particular focus on empowering Syrian women refugees. The Centre design is inspired by traditional Islamic architecture familiar to both sides of the Türkiye-Syria border. Hyperbolic

roof arches echo the architecture of the now-destroyed 12th century Aleppo Umayyad Mosque in Syria and the 1200 BC stone arches of Hattusa, the ancient capital of the Hittite Empire, in Türkiye.

After four years of planning and construction, the **Taiwan-Reyhanlı Centre for World Citizens** officially opened in September 2020, operating as a refugee community centre for more than two years before the 2023 earthquakes.

During the earthquake crisis in 2023, the Centre temporarily repurposed itself to serve as a humanitarian relief centre for both Syrian refugees and Turkish locals. The Centre today continues to provide shelter, education, recreation, commerce, and livelihoods for people who need it from both sides of the border.

COUNTERFACTUAL: 6 February 2023 M7.8 earthquake

Reyhanlı lost access to water, electricity, and food supplies due to the M7.8 earthquake on 6 February 2023. Government institutions that could feasibly have supported crisis response and recovery were forced to close for more than a month. This left little support for the pre-earthquake residents of Reyhanlı and the subsequent mass migration of survivors that entered the town from Syria and neighbouring regions of Türkiye. In the 45 days it took for Reyhanlı's key infrastructure to return to some level of normalcy, **the Centre provided overnight shelter to 2,000 people, and electricity, water, food, and healthcare to at least 6,000 more displaced people.** It also welcomed 22 international non-government organisations on-site and led the co-ordination of humanitarian relief work that supported earthquake survivors. After this 45-day crisis period, the Centre was the first institute in the region to build transitional shelters to host displaced and disadvantaged Syrian refugees and Turkish locals longer-term.

With this counterfactual, we are considering unrealised M7.8 February 2023 earthquake impacts had the Taiwan-Reyhanlı Centre for World Citizens been poorly designed or constructed.

Pre-construction risk assessments between 2016 and 2020 identified Reyhanlı as lying within an earthquake hazard zone. As a result, the Centre's main building, which is 40 m wide by 170 m long and around three stories high, was designed to resist Magnitude 7.0 and higher earthquakes. Supporting infrastructure systems were also designed with seismic resistance in mind, with a deep-water tank and large capacity electricity generator. The Centre deliberately used prefabricated building elements to reduce the amount of construction expertise needed on site. Heavy wall concrete blocks were economically sourced from the nearby Türkiye-Syria reinforced and militarised border, and easy-to-install lightweight metal sheet roofing was used to help withstand earthquake shaking (Figure 2).



Figure 2: Key aspects of the Centre design, with reference to earthquake resistance. Aerial images courtesy of the Taiwan-Reyhanlı Centre for World Citizens.



- A** 400 prefabricated concrete blocks
Strong resistance to earthquake shaking, car bombs, and rocket attacks.
- B** Light-weight metal sheet roof
Economical and highly ductile, to allow movement during shaking. Hyperbolic arches echo familiar architecture.
- C** 52 compartments
Housing classrooms, offices, cafes, shops, workspaces, and more.
- D** Safe spaces within the building
Recreational spaces, vegetable and fruit gardens, and more.

Given a MMI of at least 7.0 and a PGA (Peak Ground Acceleration) of more than 0.2 g in Reyhanlı [2], damage was expected to be negligible in buildings of good design and construction, slight to moderate in well-built ordinary structures, and considerable in poorly built or badly designed structures [6]. Poor construction practices that led to building damage in the February 2023 earthquakes included incorrect aggregate use in low-strength concrete mixture, smooth reinforcement bars that were poorly bonded to the concrete, and insufficient and too wide lateral supports to the main reinforcement bar in the columns [1]. This was more likely to occur in older, pre-2000 buildings, but it is feasible that the Centre could have been built to such low standards, if the will and emergency management planning had not been present. Had this been the case, the Centre is likely to have sustained considerable damage.

Most buildings in Reyhanlı were unmapped in open datasets prior to the earthquakes, with mapped buildings increasing from 197 in January 2023 to 22,000 in March 2023 [5]. Post-earthquake mapping showed that buildings as large as the Taiwan-Reyhanlı Centre for World Citizens were not common within the affected area. However, earthquake fatality rates for common building types in Türkiye are estimated at between 13% (reinforced masonry) and 40% (low quality confined and mixed masonry) [7]. Pre-earthquake, the Centre offered accommodation to more than 500 people, with an additional 300-400 people using the education and recreational activities daily. Assuming a daytime earthquake with all occupants present, we calculate that building performance **saved between 104 and 320 lives during the earthquake**. Following the earthquake, continuity of the food, water and power supply allowed the Centre to act as emergency shelter for an extra 1,500 people (total 2,000) overnight and up to 6,000 during the day, **providing emergency relief for 8,000 people who would otherwise have had no support**.

WHAT NEXT?

The emergency preparedness planning and the rapid humanitarian response of the Centre in supporting displaced people during and after the earthquake, when no other support was available, averted disaster for many in the region. Following the crisis, the Centre has developed and began implementing a 3-year recovery plan and transitional shelter in partnership with local organisations and individuals. The Centre will add two more habitable floors, solar panels, and water recycling systems to provide more accommodation and support for earthquake survivors, and displaced and disadvantaged groups to sustain their livelihoods and further integrate into the community of Reyhanlı.

Moving forward, the hope is that the use of architecture and effective planning as a means for influencing social change and averting disaster, as at the Taiwan-Reyhanlı Centre for World Citizens, can provide inspiration and a blueprint for future community centres in Türkiye and around the world.

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References

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