

Turkey-Syria earthquake

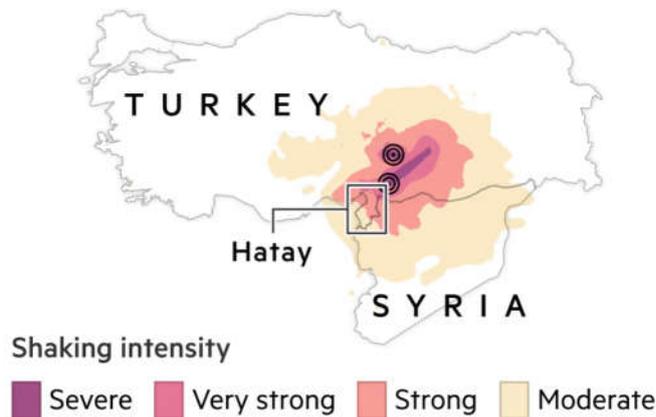
From 'paradise' to hell

How a luxury development in Turkey became an earthquake death trap



Ayla Jean Yackley in Antakya, **Adam Samson** in Ankara, **Sam Joiner**, **Dan Clark**, **Irene de la Torre Arenas**, **Ian Bott**, **Justine Williams** and **Max Harlow** in London

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All the dignitaries gathered on a hot summer day in 2011 for a groundbreaking ceremony to build “a corner of paradise”. Out of an old olive grove would rise a modern, luxury apartment complex, helping to turn the outskirts of ancient Antakya into a gleaming metropolis.

There to toast the project were Turkey’s then justice minister, the governor of the local Hatay province, the city mayor, the police chief. One of the developers boasted of his vision for “something different”, a building setting a benchmark for luxury living and quality construction in this part of southern Turkey.

Yet 12 years on the Rönesans Rezidans, a hulking iPhone shaped building with 249 flats and a swimming pool, has collapsed into a heap of rubble.

Its massive, fractured skeleton has become a notorious monument to what went wrong when a powerful earthquake hit southern Turkey and northern Syria shortly before dawn on February 6. Hundreds of residents were lost in its ruins. Rönesans — translated as “Renaissance” and billed as a beacon of aspiration — became a symbol of the rot in Turkey’s construction system.

Detailed forensic work will be required to establish precisely what weakness brought the 12-storey structure crashing down on its side. But four structural and earthquake engineers who reviewed available evidence collected by the Financial Times — including architectural plans, construction photos and images of the collapse — pointed to potential explanations from its basic design and build.

Such appraisals are just the start of a nationwide reckoning for Turkey. Across the earthquake zone, the death toll has climbed past 44,000 people in Turkey, and nearly 6,000 in Syria. Thousands of them were crushed in modern apartments less than 20 years old — built under a rulebook that was supposed to leave them standing tall, even after Turkey’s biggest quake in a century.

‘A corner of paradise’

Conceptual images of the Rönensans Rezidans





© Antis Yapı

The Rönesans complex was centred around three 12-storey, interconnected blocks, which opened onto a swimming pool, shops, a gym, and the shared amenities of a 5-star hotel. It was sold as a “lifestyle choice” for its residents.

Among them was Christian Atsu, a 31-year-old Ghanaian footballer who made his name playing for English Premier League club Newcastle United before signing with Turkey’s Hatayspor in September.

Atsu scored the 97th minute winning goal on the night before the earthquake; 12 days later, his body was recovered from the rubble. A national handball player, a banker, a psychiatrist, a lawyer, a police officer, a dentist and dozens of children were also among the dead. One person who has seen lists of Rönesans residents estimates at least 750 people were killed when the building collapsed.

Satellite imagery taken on December 22 by Planet Labs shows the **Rönesans** before the earthquake on February 6.

Completed in early 2013, the 12-storey building had 249 residential units and two shops. Satellite imagery taken a week later shows the unusual way the apartment building **collapsed**.

Automated damage assessments, funded by the US Defence Innovation Unit, enable the number of impacted buildings, and the type of damage, to be assessed quickly and at scale after a natural disaster.

This AI-based analysis was developed by training a model to spot damage using satellite imagery before and after disasters. It is advanced enough to work out that rubble on the ground is a reflection of destruction even if a building is otherwise intact.

But AI-based satellite assessments are not perfect and their estimates are conservative. An FT analysis found they struggle with unusual collapses, including the Rönnesans, and irregularly shaped buildings, such as mosques.

It means the impact of an earthquake is hard to assess solely from the sky, but satellite analysis does provide an indication of where the majority of damage has taken place.

The **East Anatolian fault line** that caused the earthquake runs in a northeasterly direction 26km from the Rönesans.

Outrage over Turkey's loss has been directed at the property developers, architects and engineers who erected homes that became tombs for so many. Police have arrested more than 180 people and are searching for hundreds more. One builder was caught fleeing on a boat, according to state media, and at least three others were arrested at airports.

One of them was Mehmet Yaşar Coşkun, founder of the Antis Yapı group that developed the Rönesans. Days after the earthquake, he was detained at Istanbul Airport trying to board a flight to Montenegro, where his family company also has offices. Footage aired by the state-run Anadolu news agency showed Coşkun being stopped by four officers, handcuffed and escorted away.

Coşkun told police he did not know why Rönesans came down. He said a ground survey showed it was in "sturdy condition", reinforced concrete was used, and the structure complied with building codes. Coşkun's lawyer, Kübra Kalkan Çolakoğlu, said only part of his statement to police was released by state media. She declined to comment further until her client is formally charged. The Antis Yapı group did not respond to calls.



Google street view images of the Ronasans taken in November 2022 © Google

Concerns over the building's design were raised before the earthquake. Ferit Şahin, whose brother Şahin and nephew Uğur died at Rönesans, said his family had filed a lawsuit against Antis Yapı in 2016, alleging safety violations including the lack of an earthquake shelter and proper access for emergency vehicles.

Coşkun's company denied wrongdoing and the lawsuit languished in the courts. Ferit Şahin, whose family had owned the land upon which the complex was built, said a series of experts called by Coşkun testified to there being no major problems at Rönesans.



Drone footage shows the 12-storey apartment building collapsed sideways © @adamaxoi

The Şahin family had questioned the building’s safety, but even they never suspected the extent of its vulnerability. “When I woke up to the news of an earthquake, I wasn’t worried about Şahin. I thought if anyone is safe, it will be him at Rönesans,” said Gökhan Şahin, Ferit and Şahin’s brother. “It was the most prestigious building in Antakya. None of us would have ever expected this to happen.”

When the Şahins decided to develop part of the olive grove they had inherited from their late mother, the family picked Coşkun, a respected community figure who had served as head of Antakya’s chamber of architects. In exchange for the land, the family received 90 of the 249 units, most of which the Şahins subsequently sold. Only Şahin Şahin, 55, continued to live at Rönesans.

“We thought we had found the best people for the project . . . I was impressed by their professionalism. I trusted them. I was blinded,” Gökhan Şahin said. But with hindsight, even small things are seen in a different light. “The Coşkuns never lived at Rönesans,” he said. “That really surprised me.”

Gökhan Şahin is tormented by thoughts of his brother and nephew’s final hours; a DNA sample was required to identify 32-year-old Uğur’s body. “The

most painful thing is not knowing how they died, whether it was right away or if they survived the initial collapse and were still alive those first days, waiting for help that never came,” he said.

From construction to collapse

Satellite imagery shows work starting on the Rönésans Rezidans in March 2011



Oct. 2011



Feb. 2014



Dec. 2022





Source: Google Earth, Maxar Technologies, CNES / Airbus, and Airbus

Civil engineers and earthquake specialists say it is too soon to tell exactly why the Rönesans fell over. But there is consensus on one point: such modern blocks should not have collapsed as a result of the 7.8 magnitude earthquake, nor the second 7.5 magnitude shock that followed several hours later.

“Our buildings should resist those seismic forces,” said Oğuz Cem Çelik, professor of structural and earthquake engineering at Istanbul Technical University. Severe damage is possible, but collapse “is something different”. “There is a red line,” he said of the regulations. “We can never accept a building collapse [however forceful] the shaking.”

Mevlüt Kahraman, director of construction and technical works at Ankara’s Bilkent University, said local measurements suggest the forces shaking the

Rönesans probably exceeded the scenario for a once-in-2,500-year earthquake — the maximum defined in building codes.

But even if severe damage may be expected at that intensity of shaking, the design should at least give people the ability to exit.

The nature of the collapse has drawn attention. Çelik said it is rare for a large, new building to topple over in the way the Rönesans did, suggesting there were flaws in the architectural work, structural engineering or in the construction process.

Antis Yapı's Yalçın Coşkun, a civil engineer and Mehmet Yaşar's brother, said [in 2013](#) that his design brought three apartment blocks together to maximise the flats facing south.

But the thin, rectangular shape of the building carried risks. Jane Wernick, a UK-based structural engineer and consultant to engineersHRW, said it would have had an 8:1 length-to-width ratio given it was roughly 134 metres long by 17 metres wide.

Such a ratio would require specialised analytical work on the site and is “probably more than we would think is wise if you're building in an earthquake region”, she said.

Kahraman added that “symmetry is important” to engineers designing for earthquakes and that a square building would have been more resilient. He pointed to one potential reason for the distinctive collapse: the long building may have been more vulnerable to the quake's “overturning” forces. A smaller single tower in the Rönesans complex remained standing.

Another factor is the ground under the Rönesans. The type of soil in an earthquake-prone area plays a big role in the structure's stability because it determines how the tremor's power is transmitted.

Typically when a new building is being designed, engineers will simulate how earthquake forces will ripple through the earth, and then use that information

to guide the design of a building's foundation. Soft soil, which can amplify earthquake waves, is common in Hatay province.

How different types of bedrock affect the degree of impact shockwaves have on buildings during earthquakes

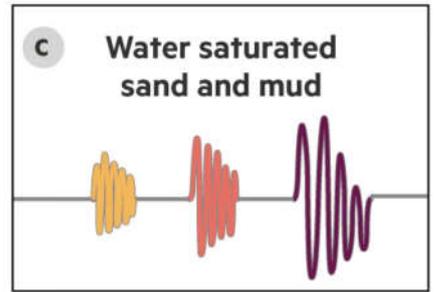
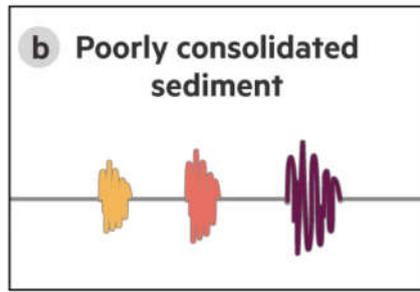
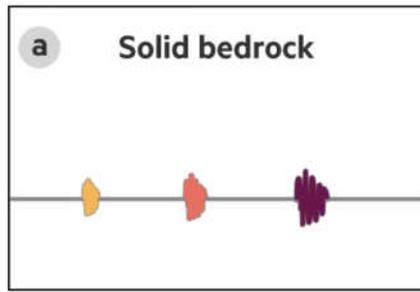
Seismic waves travel through material at different speeds and amplitude — causing varying degrees of damage

Seismograms for each type of bedrock

High-frequency
low-amplitude waves
(less destructive)

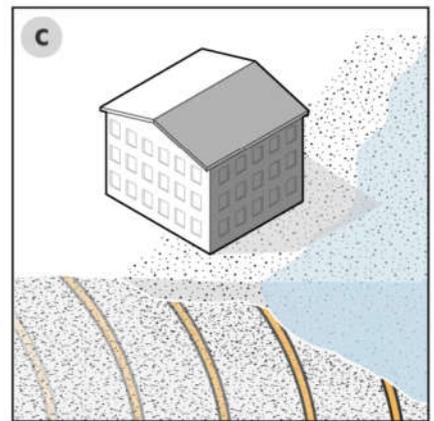
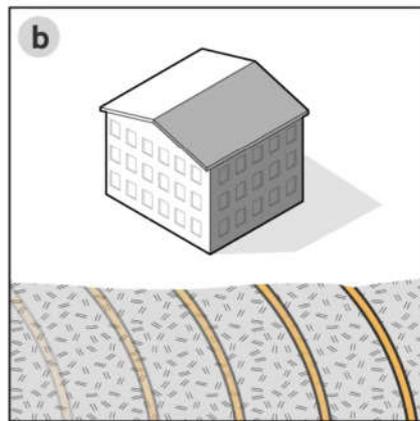
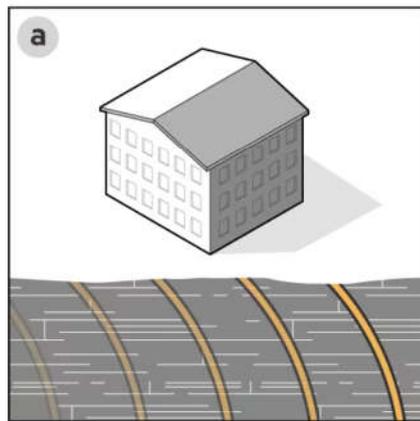


Low-frequency
high amplitude waves
(more destructive)



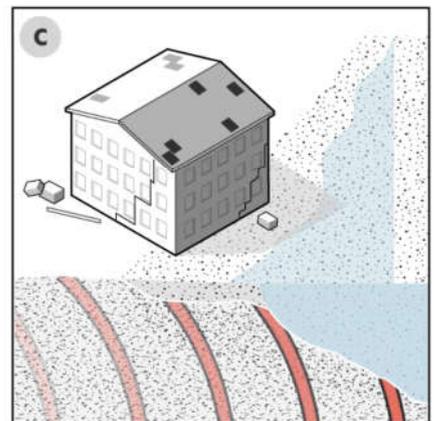
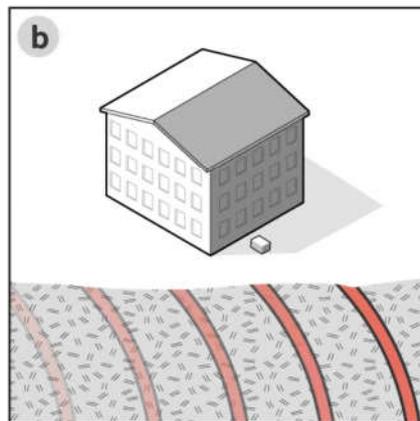
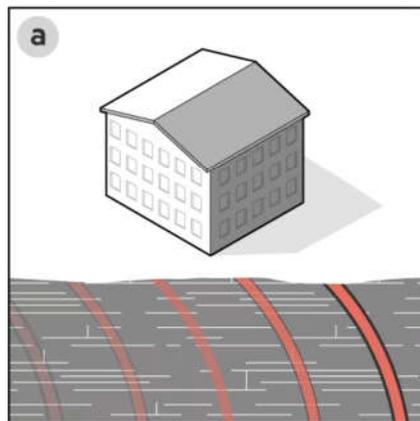
Compressive P waves

Arrive with a compressive bump and rarely cause much damage



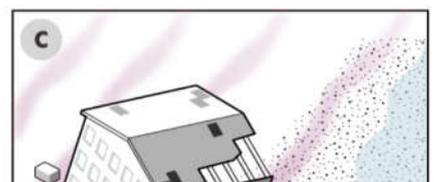
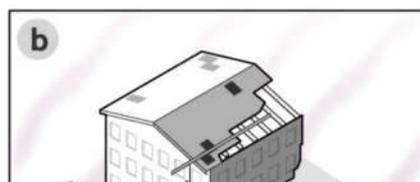
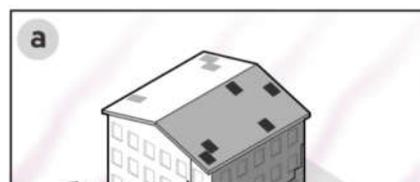
Shearing S waves

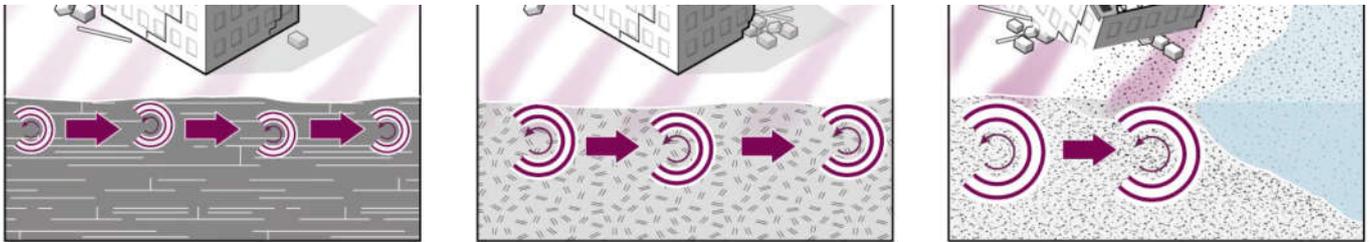
Slower moving, and introduce a side-to-side motion that can crack walls and dislodge objects



Rolling surface waves

Slow moving and increasing in size, they ripple the surface, and can cause catastrophic structural failure





Source: IRIS Consortium; FT research © FT

“The importance of the ground comes down to how stiff it is, which influences how much it shakes. That will have informed the engineers about the sort of horizontal forces they should have been designing for,” said Wernick.

A security guard who witnessed the Rönnesans collapse told bereaved family members the building withstood about 40 seconds of shaking. The earthquake’s duration was 65 seconds in total.

Forensic investigation of the collapse would also assess what is under the ground. Alessandro Margnelli, technical director at London-based civil engineering firm AKT II, said one potential weakness could be in the piling, structures drilled 15 to 20 metres into the earth’s foundations to help bolster the building’s structural stability.

Materials would also be crucial. Concrete used in large buildings typically contains steel reinforcing bars. “Rebar” is especially important in earthquake prone areas, according to Kahraman, because buildings may sway on their foundation as a result of the shaking.

Concrete is very good at handling compression forces, which come when it is pushed down. But the material is bad at handling pulling, or tensile forces. The rebar is essential in helping the overall building dampen the tensile forces that come into play for when a building is rocking.



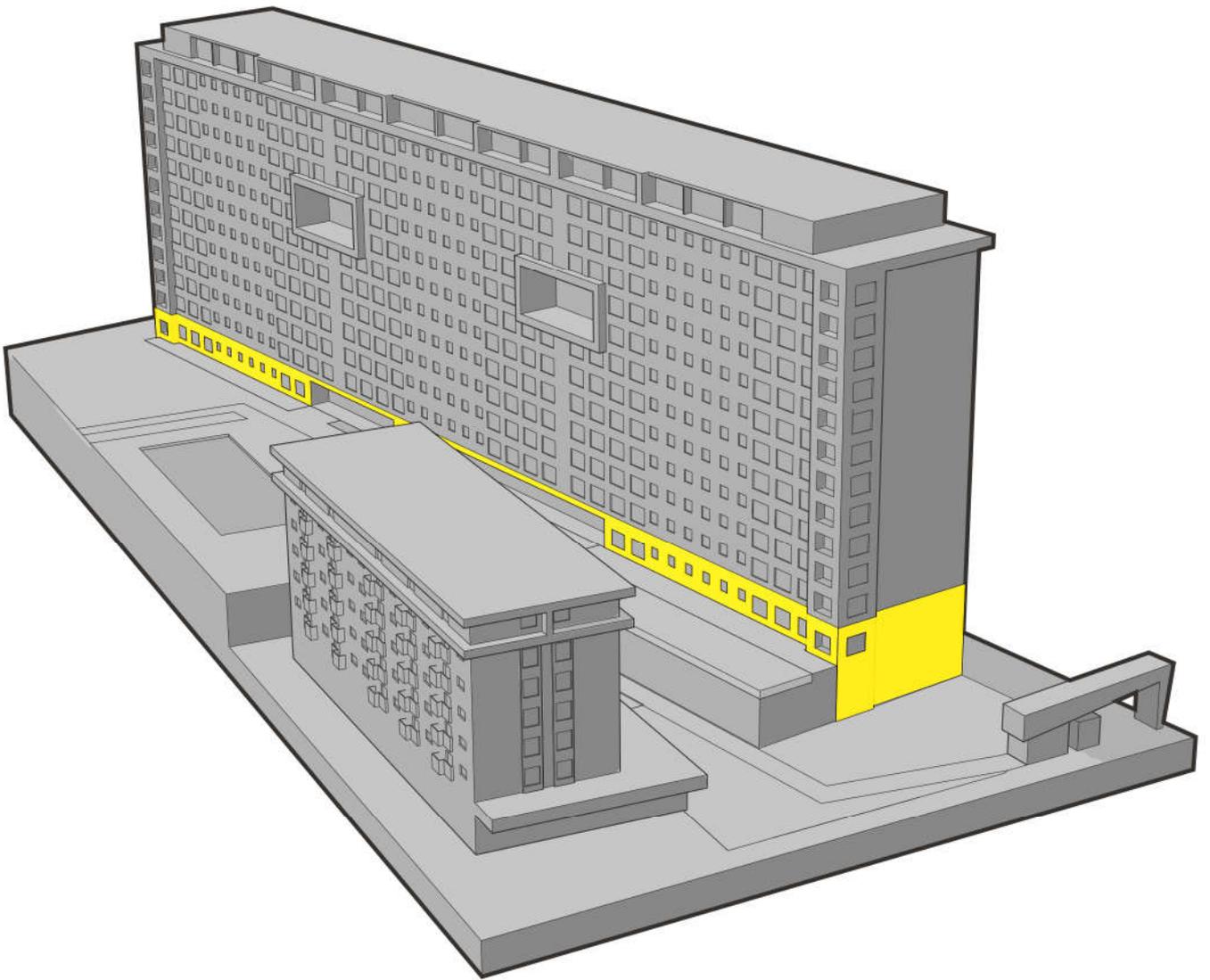
The Rönesans under construction in 2012 © Antis Yapı

The area where the foundations meet the main part of the building will also be closely examined for much the same reason. The risk in earthquakes is that if the top of the building moves against a rigid base, it can tear off and cause a catastrophic loss of stability.

After the quake, one relative of a victim described the building as almost having broken before its sideways collapse. “You are left with a huge pile of rubble with a giant building’s skeleton on top of it. This is what made the rescue so difficult,” he said.

Wernick added: “From the photos, it looks like the walls have pulled off the foundations — probably as a result of the huge tensile forces.”

Kahraman said he was also focused on this lower part of the building. The entrance hall to the Rönesans is taller than the other floors. He noted that this imbalance can lead to a problem known as a “soft storey” where one floor is more flexible or less able to withstand earthquake forces, making it a potential weak spot when an earthquake hits.



Engineers told the FT extensive analysis would need to be carried out before a building with the **dimensions** of the Rönnesans was constructed in a seismic zone. This would involve making a computer model of a building, including all its internal structures, before stress testing it against estimated earthquake vibrations.

Drone footage filmed in the aftermath of the earthquake appears to show that the Rönesans split on the **first floor** before collapsing sideways.

The strength, thickness and quantity of **shear walls** will be one potential line of inquiry. These structural walls bolster a building, prevent swaying and help distribute horizontal forces such as those from the weight of people and furniture — or earthquakes in extreme scenarios — into the foundations and ultimately the earth.

Another area of investigation will focus on the **foundation** and the set up of a garage that appears to be below ground level. Buildings in earthquake prone areas are often built with “piling” pipes dug deep into the earth to support structural stability.

Verifying Coşkun’s claim that the Rönesans was built from appropriate materials will require extensive testing, said Cesim Parlak, a lawyer working with victims’ families. “The priority at the moment is technical evidence collection, namely a core sample and steel analysis, before the rubble is cleared away,” Parlak said.

Such research will potentially inform future civil suits. If the building materials are found to be appropriate, Parlak argues the “main responsibility” will fall on public authorities who approved the zoning permit and building

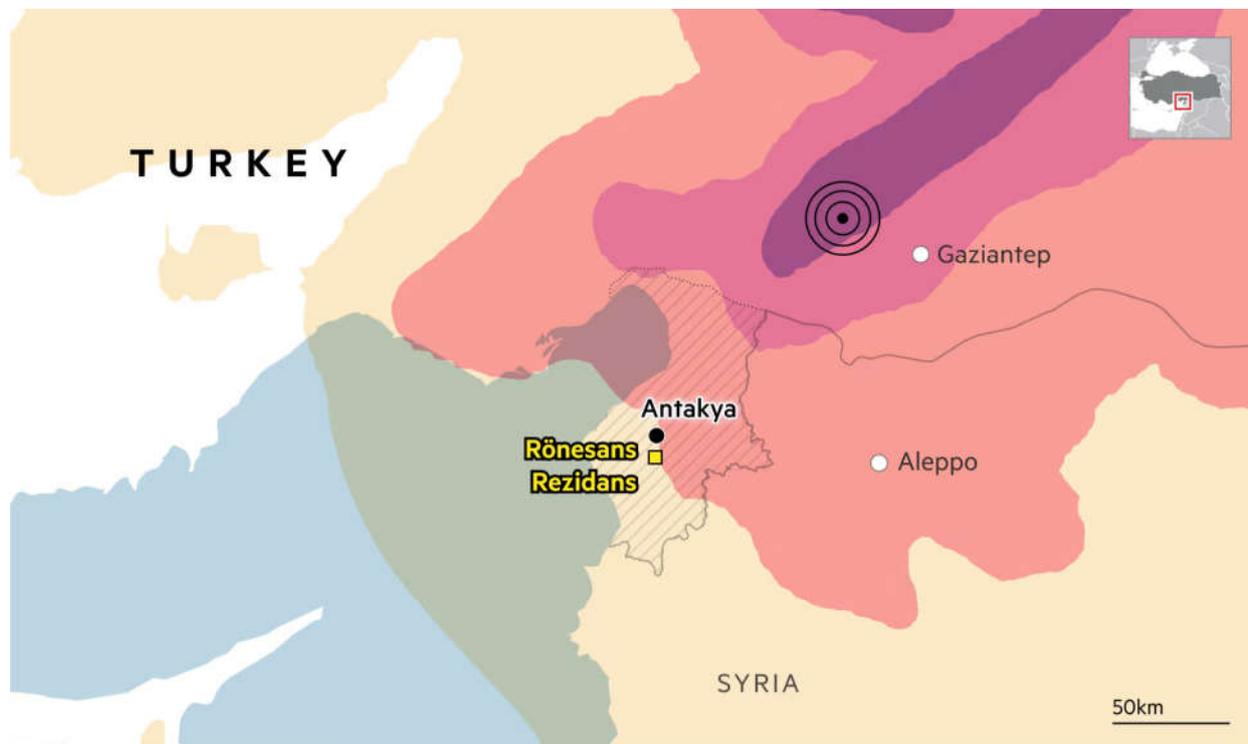
licences for a project design that was unsuitable for that site.

“If we just blame the contractors, then the next time there is an earthquake, the same mistakes will have been repeated,” Parlak said.

An estimated 6.7mn residential buildings across Turkey need to be retrofitted or rebuilt to meet modern standards — a process that would cost a staggering \$465bn, the [World Bank](#) said in 2021. Just 4 per cent have had the necessary work done.

President Recep Tayyip Erdoğan, who has overseen a construction boom during his two decades in power, has faced a backlash over lax enforcement of building codes, drawing particular ire for an amnesty in 2018 that forgave faults in millions of buildings.

Meanwhile the main opposition Republican People’s party has said it will launch an internal investigation of municipalities it controls in the earthquake zone, including Antakya, to determine whether local officials failed to uphold building standards.



Shaking intensity

Severe Very strong Strong Moderate

Source: USGS

© FT

Lütfü Savaş, the mayor of Antakya who attended the ceremony to lay the foundations for the Rönesans in 2011, has defended Coşkun since the earthquake. Savaş told Show TV that Coşkun was an “idealist” who “very likely built it correctly”. He later said his office was not involved in Rönesans’ licensing, which was handled at the district level.

Savaş told the FT: “It’s not the only new building to collapse. It would be wrong to say this is just about the Rönesans.”

The full investigation into the Rönesans has barely started, but it is already clear the road to justice may be complicated.

Within days of the quake, Parlak said authorities began demolishing the urban affairs ministry’s provincial office in Hatay, where construction permits and inspection reports were stored. The one-storey office was still standing at the time and nobody was trapped inside.

Lawyers were able to get a court order to eventually halt the demolition and

save some material. But Parlak said “a very significant portion of documentation was lost”.

No province in Turkey suffered as much damage as Hatay. More than 30,000 buildings in the district have been severely damaged or collapsed, according to the World Bank.



Most of the damaged buildings were older properties, constructed before 2000, according to a separate study by the Middle East Technical University in Ankara. A set of tighter codes and surveillance requirements was put in place between 1998 and 2001, in part because of a devastating earthquake that struck northwest Turkey in 1999, killing at least 17,000 people.

Despite the tougher regime, more than 1,000 buildings constructed after 2000, including the Rönesans which opened in 2013, collapsed or were heavily damaged across Turkey as a result of the February 6 earthquake. “This appears to be an important observation demanding further investigations on the design and construction quality of those buildings,” the researchers concluded.

Grieving families are still searching for more than 80 people’s bodies at the Rönesans site. Many have provided DNA samples; they were still awaiting the results, one relative said.

“These homes were sold with the slogan ‘A Corner of Paradise,’ but it was my family’s end,” said Suphi, who kept vigil next to the wrecked building until the bodies of his three family members were recovered eight days after the quake.

His mother, brother and eight-year old nephew had moved into the Rönesans so that the boy could enjoy the swimming pool, bicycle paths and a playground “and grow up somewhere nice”, said Suphi, who declined to give his last name. “But there was no escape. They never stood a chance.”

Additional reporting by Chris Cook and Graham Parrish

Notes and sources: Damage assessment of Hatay based on data provided by a joint partnership between the US Department of Defence [Innovation Unit](#), Berkeley [Artificial Intelligence Research Lab](#), Microsoft’s [AI for Good Lab](#) and [Planet Labs PBC](#). Map information on the tectonic plates from [Ahlenius, Nordpil and Bird](#). With thanks to Adam Axoi for providing the drone footage of the Rönesans Rezidans and Antakya.



Turkey-Syria earthquake

Turkey to press ahead with May 14 elections

WEDNESDAY, 1 MARCH 2023

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