Why the earthquake in Morocco has caused so much damage

An earthquake of magnitude 6.8 struck Morocco on Friday night. So far, the death toll stands at well over 600.

Written by **Arjun Sengupta**
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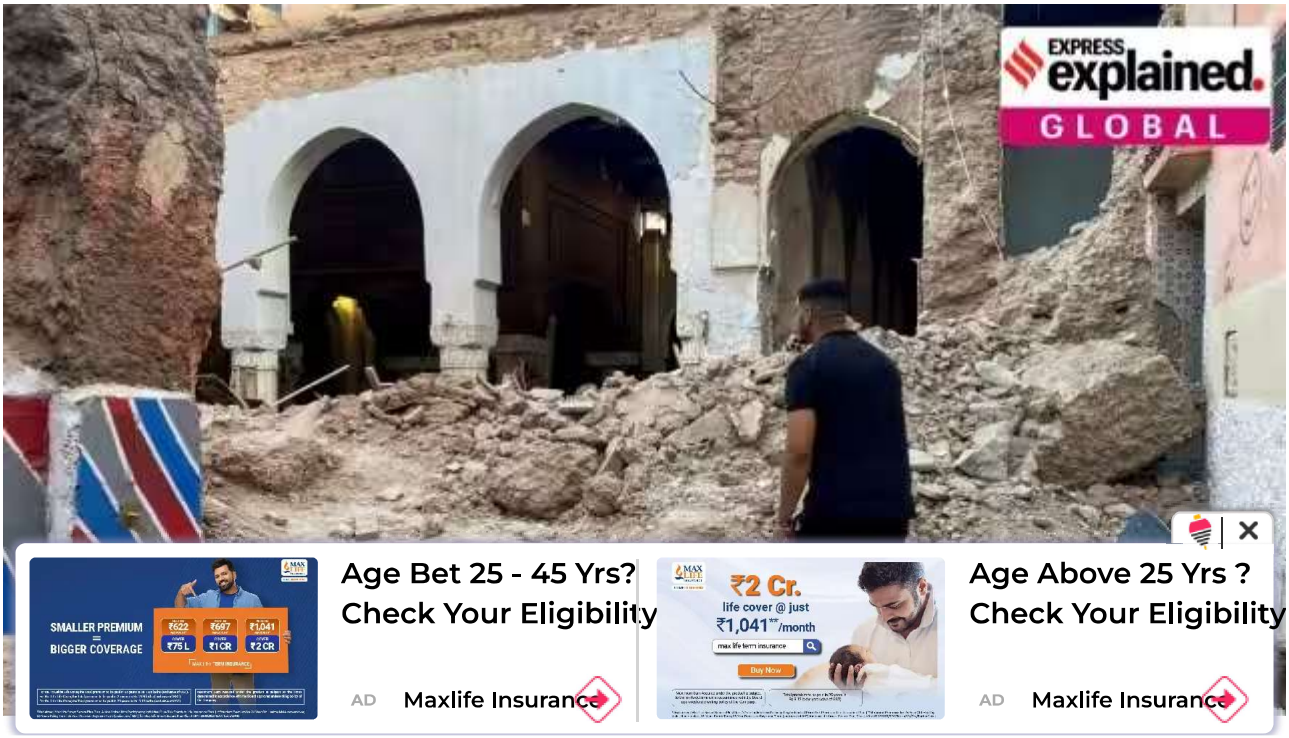
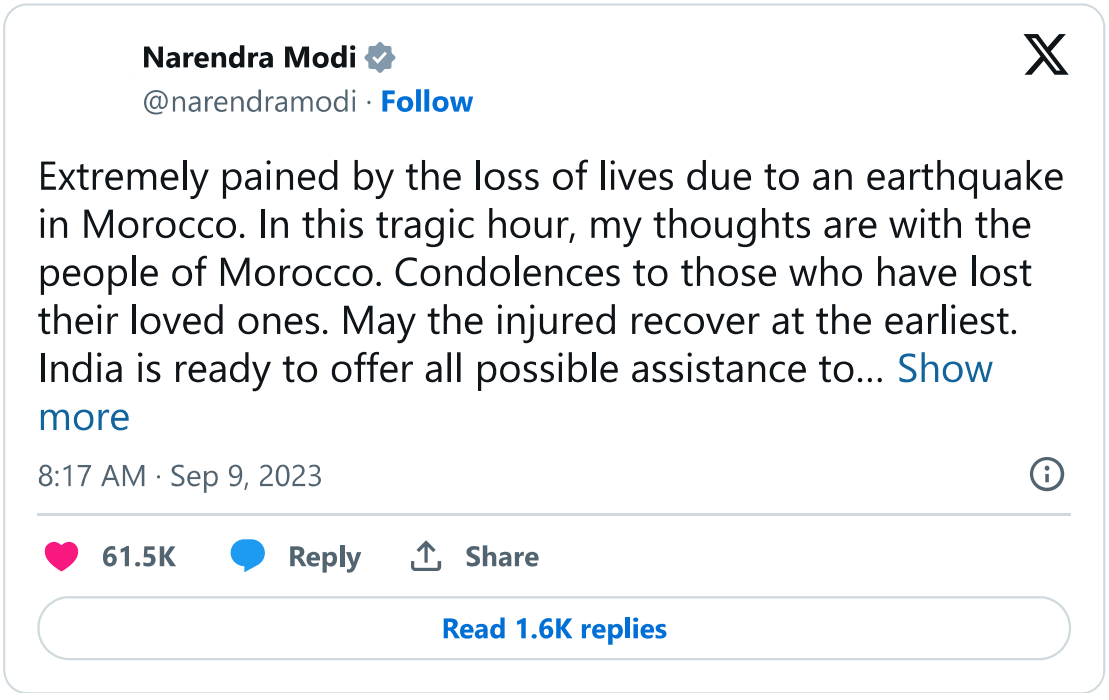


A man looks at damage in the historic city of Marrakech, following a powerful earthquake in Morocco, September 9, 2023. (Photo: REUTERS/Abdelhak Balhaki)

A rare, powerful earthquake struck Morocco late Friday (September 8) night, **killing hundreds of people and damaging buildings**, including in the historic city of Marrakech.

Morocco's Interior Ministry said Saturday morning that **at least 632 people had died**, mostly in Marrakech and five provinces near the quake's epicentre, *The Associated Press* reported. Another 329 people were injured. Casualties are expected to rise as the search for the missing continues and rescuers make it to remote areas in the Atlas mountains.

World leaders have extended their condolences and offers for help for the north African nation, even as aftershocks continued to reverberate, keeping people on their toes. Prime Minister Narendra Modi, in a tweet Saturday morning, offered "all possible assistance" to Morocco.



Shallow and dangerous

As per the US Geological Survey, the earthquake, which hit at 11.11 pm local time (3.41 am IST), had a magnitude of 6.8. An aftershock of magnitude 4.9 earthquake rocked the region just 19 minutes later.

Earth's surface, though Morocco's own seismic agency pegged the depth at 11 km. Either way, it was a fairly shallow quake.

The epicentre of the quake (red dot) is roughly 70km south west of Marrakech. (Source: USGS)

According to experts, such quakes are generally more dangerous as they carry more energy than when they emerge to the surface, when compared to quakes that occur deeper underneath the surface. While deeper quakes do indeed spread farther as seismic waves move radially upwards to the surface, they lose energy while travelling greater distances.

A rare quake and no preparation

Earthquakes are also not very common in North Africa, with seismicity rates comparatively low along the northern margin of the African continent, according to the USGS. Lahcen Mhanni, Head of the Seismic Monitoring and Warning

was the strongest ever recorded in the mountain region, the AP reported.

This means that unlike regions which frequently face such quakes, Morocco was also not prepared for such a calamity. While a 1960 earthquake, which killed thousands, did bring about changes to construction rules, most Moroccan buildings, especially in rural areas and older cities, are not built to withstand such strong tremors.

A man walks past a damaged wall of the historic Medina of Marrakech Saturday morning. (AP/PTI)

In Marrakech, many houses in the tightly packed old city, a UNESCO World Heritage Site, had collapsed. Footage of the mediaeval city wall showed big cracks and sections that had simply fallen off. Rescue teams are currently working to find people underneath the rubble. Many people continue to stay outdoors in fear of another quake.

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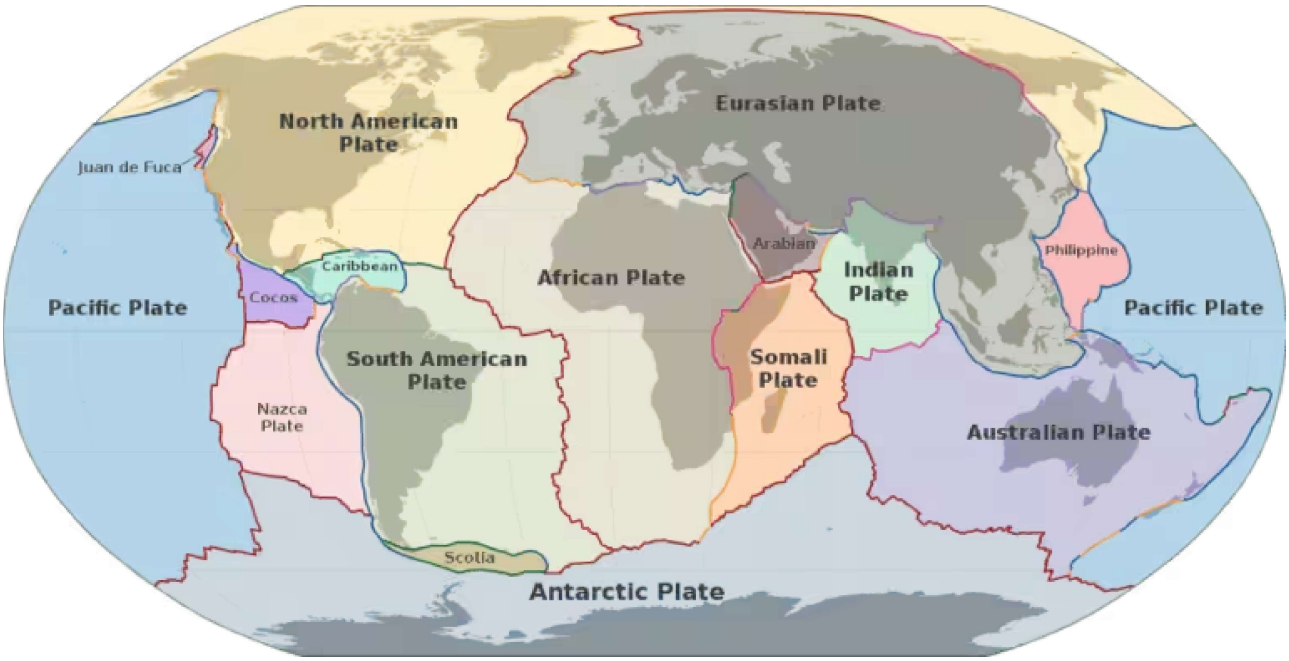
are under the rubble and people are working hard to rescue them using available means in the village," Montasir Itri, a resident of the mountain village of Asni near the epicentre, told Reuters, adding that most of the houses in the village were damaged. Villages such as Asni lie on the Atlas mountains, making access a major issue for authorities and rescue teams.

Why the Morocco quake occurred

While seismicity rates are indeed lower in the region, making earthquakes rarer, they are not completely unheard of. According to the USGS, "large destructive earthquakes have been recorded and reported from Morocco in the western Mediterranean".

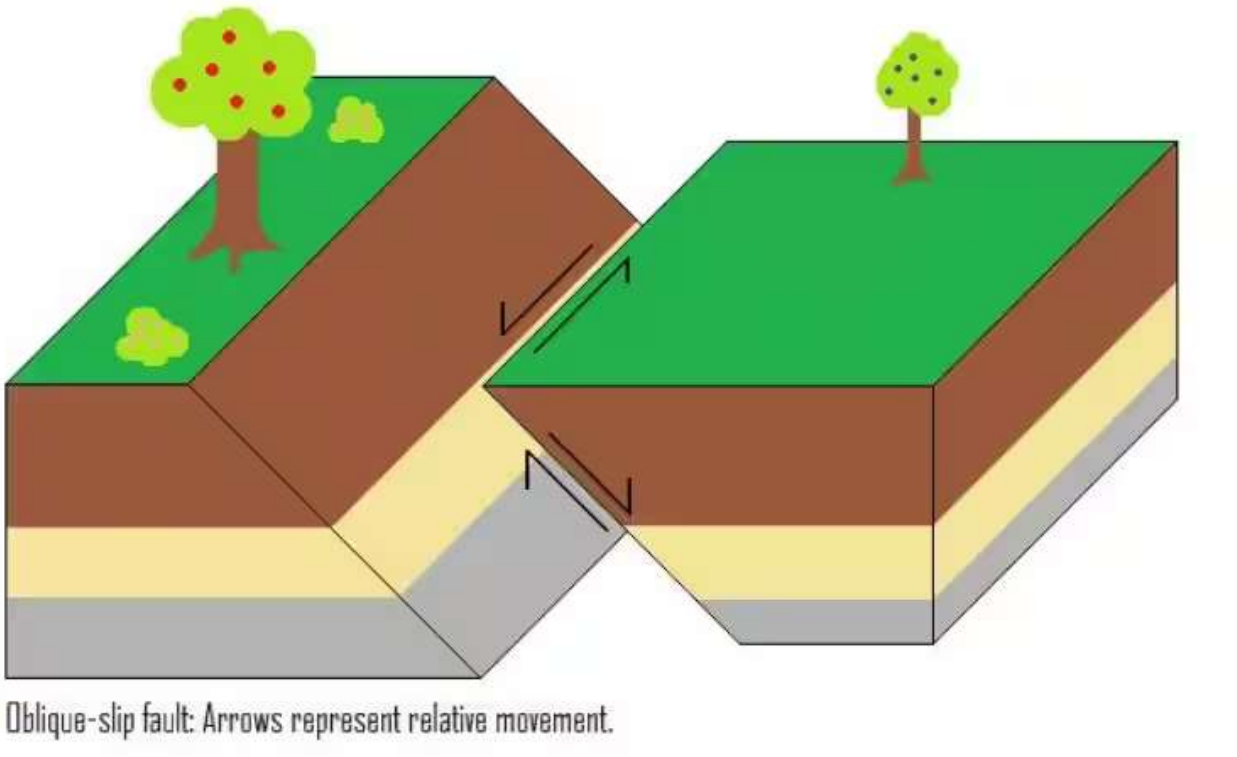


A map of the major tectonic plates on our planet. The quake occurred roughly 500 km away from the point where the African and Eurasian plates meet. (Wikimedia Commons)

Such quakes occur due to the "northward convergence of the African plate with respect to the Eurasian plate along a complex plate boundary." With respect to yesterday's quake, the USGS attributed it to "oblique-reverse faulting at shallow depth within the Moroccan High Atlas Mountain range".

A fault is a fracture or zone of fractures between two blocks of rock. Faults allow the blocks to move relative to each other, causing earthquakes if the movement

respect to the other.



Here the the movement occurs, in two directions. Horizontal movement along the slip plane and vertical movement along the dip plane. (Wikimedia Commons)

Scientists use the angle of the fault with respect to the surface (known as the dip) and the direction of the slip along the fault to classify faults. Faults which move along the direction of the dip plane are dip-slip faults, whereas faults which move horizontally are known as strike-slip faults.

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term 'reverse' refers to a situation that the upper block, above the fault plane, moves up and over the lower block. This type of faulting is common in areas of compression — when one tectonic plate is converging into another.

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