

Earthquakes pose major threat to monuments in the sub-continent

Atul Sethi | TNM

A few years back, when a devastating earthquake struck Bhuj in Gujarat, it left behind a number of casualties. Besides life and property, the other casualties were the area's many monuments. Of the region's 329 protected monuments, more than 100 were damaged, some of them beyond repair, says K N Dikshit of the Indian Archaeological Society, a body of Indian archaeologists, which surveyed the monuments in the region, after the earthquake. The heritage of centuries, says Dikshit, was, as a result, reduced to rubble in a mere matter of seconds.

That earthquakes have been a major threat to the sub-continent's cultural heritage is no secret, says V K Joshi, former director of the Geological Survey of India (GSI). "Turmoil within the earth is a constant process. Our planet, on an average, faces at least one great earthquake in a year, whereas, nearly 9000 earthquakes of very minor category shake it daily," he says. Monuments, especially those that have been around for centuries

are therefore quite naturally susceptible to such tremors.

The list of monuments that have been damaged by earthquakes is pretty long. From ancient temples of the Himalayan region to forts and palaces in the plains — all of them have been affected in some way or the other by past earthquakes, says Joshi.

Of these, the monuments that fall in the seismically active zones IV and V — which include the Himalayan and Indo-Gangetic belt and the alluvial tracts of Gujarat and Rajasthan — are exposed to a greater seismic hazard. In fact, a study conducted a few years back of 50 monuments located in different geomorphic and seismic zones of the country found that 60% of monuments located in zones IV and V have already been damaged to quite an extent by earthquakes.

Delhi — which falls in Seismic Zone IV, for instance, has often been witness to damage caused by earthquakes. In 1803, the Qutb Minar lost two of its top stories in an earthquake which had its epicenter at Mathura. Similar devastation was wrecked by the Kangra earthquake of



Photo courtesy: Randolph Langerbach/UNESCO

IN RUINS: The 18th century Rao Lakha Chhatri in Bhuj, after the 2001 earthquake

1905 which severely damaged the 5th century Kangra fort.

Persistent earthquakes in the Uttarakhand region of the Himalayas have caused consistent damage to the temples there. The temple at Yamunotri — one of the *char dhams* in the Himalayas, incidentally, was completely destroyed by a

major earthquake in 1923 and was later rebuilt. Similarly, the Jageshwar and Baijnath temples in Kumaon have been facing the ire of earthquakes for centuries.

The irony, says Joshi, is that we generally tend to only remember earthquakes of very high magnitudes. "Since a major earthquake strikes only after a

considerable lapse of time, often precautions against earthquake damage are forgotten or they remain at a low priority," he says. More often than not, says Dikshit, action is taken only after the damage is done.

Perhaps realising this, the Archaeological Survey of India (ASI), which is responsible for the preservation and conservation of monuments in the country, is now taking steps to be proactive. The ASI has recently sought the help of professors at IIT Kanpur to help them assess the earthquake resistance capacity of monuments and to suggest ways to protect them.

So does this mean that we can finally safeguard our monuments against seismic forces? It won't be that easy, since the process involved in safeguarding a monument against earthquakes is a long drawn out one, says Professor Durgesh Rai of IIT Kanpur, who is part of the team handling the project. "Gauging the seismic strength of historic structures requires a different level of expertise than that for conventional modern structures," he says.

In the first step, the project team would be undertaking a pilot study of two monuments — the Bara Imbarra and the Roomi Darwaza in Lucknow — to assess their structural deficiencies and find ways to rectify and strengthen them.

The next step would involve retrofitting — where the existing structure would get modified, if necessary, to make it more resistant to seismic activity. "Although we can't prevent an earthquake from hitting the monument, we can increase the monument's resistance by retrofitting it," says Rai.

The success of the project would greatly depend on how the strengthening measures are achieved, while keeping intact the historic and architectural fabric of the monument. Another challenge would be to map every brick in the monument, so that it can be rebuilt in its original form, in case it is destroyed.

All of this would take time, and that is something which is in short supply. For an earthquake can strike anywhere, anytime. Hopefully, when one does strike, it would catch us better prepared.

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