

Earthquake Hazard Assessment of Kashmir Valley

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Abstract: The Kashmir Valley is a scenic region located in north-western India, known for its natural beauty and cultural significance. Despite its attractive features, the valley is situated in an active seismic zone and is vulnerable to earthquakes, which have caused widespread damage and loss of life in the past. In this paper, we present a hazard assessment of the Kashmir Valley to understand the seismic risk posed to the region. The study provides a comprehensive analysis of the geophysical setting of the valley, historical earthquake activity, and the current seismic hazard assessment. The paper also highlights the measures being taken to reduce the impact of earthquakes in the valley, with a focus on the role of the government, local communities, and NGOs in disaster risk reduction.

Keywords: DDMA, Earthquake, NDMA, NDMP, Seismic, Seismicity, SDMA.

1. Introduction

The Kashmir valley, nestled in the north-western folds of the Himalayas, is surrounded on almost all sides by mountain ranges. (Hussain. M, 2002) The Kashmir region lies between latitudes 32° and 36° N, and longitudes 74° and 80° E. It has an area of 68,000 sq. mi (180,000 km²). Kashmir has a different climate in every different region owing to variation in altitude. Kashmir is also regarded as a beauty spot of the medicinal and herbaceous flora in the Himalayas. (Wikipedia) The valley of Kashmir termed as the paradise on the earth is famous for its lakes, streams, greenery, splendid trees, beautiful mountains, fresh air, clean water and fertile soils, growing rice, maize, apples, wheat, almonds, walnuts, peaches, and saffron. Valley is filled with thick deposits of alluvium which has blanketed even lower slopes of the surrounding ranges. (Hussain. M, 2002) Despite its attractive features, Kashmir is seismically active earthquake prone area. The region has a tradition of experiencing mild to strong earthquakes (Bendick and Bilham, 2001) Kashmir lies in the area of collision of the Indian and Eurasian tectonic plates. The collision of these plates has resulted in the birth of the Himalayan Mountain range, and this is the cause of seismicity and seismic activity in the region. (Wikipedia)

2. Historical Earthquake Activity

The Kashmir Valley has a long history of earthquakes, with records of earthquakes dating back to the 8th century AD. The valley has experienced several devastating earthquakes in the past, including the 2005 Kashmir earthquake, which had a magnitude of 7.6 and resulted in the loss of over 75,000 lives.

These earthquakes highlight the vulnerability of the Kashmir Valley to earthquakes and the need for adequate preparedness measures to reduce the impact of future earthquakes. As per National Center for Seismology, Kashmir is located in a seismic Zone V, or a very high-risk zone and it continues to struggle with frequent quakes. In 2020-21 alone, the region has faced nearly 100 tremors. In 2007, a research conducted by the University of Kashmir in collaboration with the University of Colorado in Boulder, US, gave a warning regarding a possible 9.0 magnitude earthquake potentially hitting Kashmir in near future.

3. Earthquake of 2005 (Kashmir)

A disastrous earthquake of magnitude 7.6, occurred on October 8, 2005, in the Pakistan; and adjacent areas of India and Afghanistan. At least 79,000 people were killed and more than 32,000 buildings collapsed. The devastating earthquake struck at 8:50 a.m, with epicentre located 19 kms northeast of Muzaffarabad. At least 32,335 buildings collapsed in various cities in the Kashmir region—including Anantnag and Srinagar in Jammu and Kashmir UT. The severity of the damage and the high number of fatalities were exacerbated by poor construction in the affected areas. (Britannica, 2022)

4. Seismic Hazard Assessment

Seismic hazard assessment is a critical tool in understanding the likelihood of earthquakes occurring in a particular region. Seismic hazard assessment is an effort to quantify earthquake hazard and its associated uncertainty in time and space and to provide estimates for seismic risk assessment. Although seismic hazard assessment is more a scientific issue, it deserves special attention because of its direct impacts upon the society. The two approaches used for seismic hazard assessment are probabilistic seismic hazard analysis (PSHA) and deterministic seismic hazard analysis (DSHA). An alternative, seismic hazard analysis (SHA), utilizes earthquake science and statistics directly and provides a seismic hazard estimate that can be readily used for seismic risk assessment. (Wang. Z, 2011)

5. Measures to Reduce the Impact of Earthquakes

In order to reduce the impact of earthquakes in the Kashmir Valley, the government and local communities have taken several measures. The government has established a National Disaster Management Authority (NDMA) to coordinate

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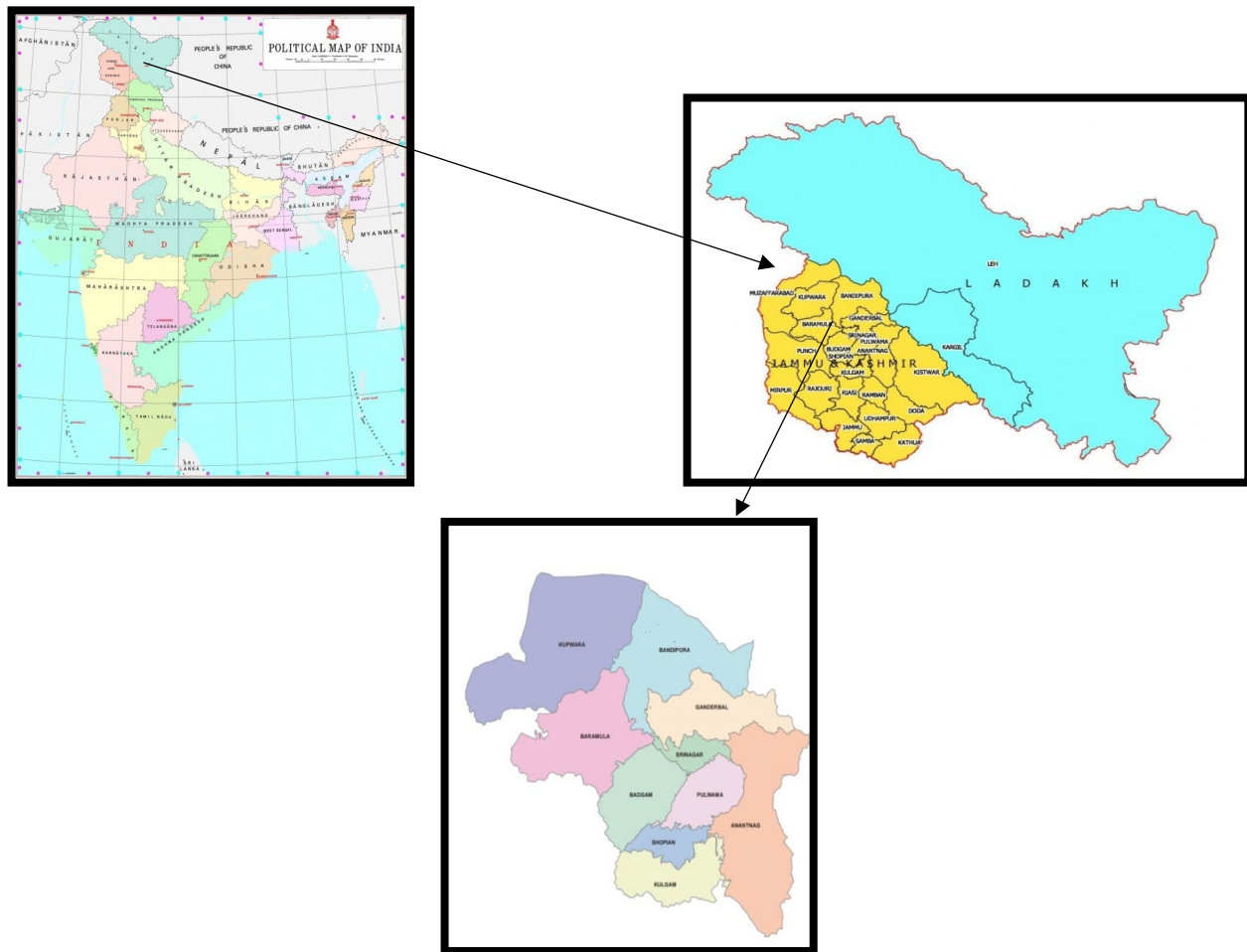


Fig. 1. Location map of Kashmir

(Source: <https://www.mapsofindia.com/maps/jammuandkashmir/>)

(Source: <https://ceojk.nic.in>)

disaster response efforts and to provide support to affected communities. The NDMA has also developed a National Disaster Management Plan (NDMP) to guide disaster response efforts and to ensure that adequate resources are available in the event of a disaster.

In addition to NDMA, SDMA (State Disaster Management Authority) and DDMA (District Disaster Management Authority) are also working on ground to accomplish earthquake mitigation, preparedness, response and recovery. State and District level plans have also been formulated to ensure timely response. Civil defence is actively organising workshops and trainings on how to respond to earthquakes. Several local NGOs and community-based organizations are working to increase awareness about earthquake preparedness and to provide support to affected communities. These organizations are conducting earthquake drills, training community members on disaster response measures, and providing support to affected families.

6. Conclusion

In nutshell, Kashmir Valley is highly susceptible to earthquakes due to its location in an active seismic zone. The valley has a long history of earthquakes, with several devastating earthquakes occurring in the past. The Indian

Meteorological Department has categorized the valley as a high-risk zone for earthquakes, and the likelihood of large earthquakes occurring in the region in the future is high. In order to reduce the impact of earthquakes, the government and local communities have taken several measures, including establishing NDMA, SDMA, DDMA, and increasing awareness about earthquake preparedness. It is also important to assess whether the structures and buildings are able to cope with the disaster. It has been estimated that incorporation of disaster risk reduction (DRR) strategies accounts for less than 4% of total investment. More focus should be given to retrofitting and following building codes while constructing houses, schools and other infrastructure. Risk identification, assessment and monitoring are very important for timely and effective response. Moreover, Seismic hazard assessment can be achieved by surveying and mapping of seismic hazard zones in the valley. This can serve as a pre-earthquake tool and prove beneficial in post-earthquake phases.

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