

Joshimath Land Subsidence

Joshimath in Uttarakhand had experienced an enormous landslide-like incidence leading to the development of various cracks. This topic has been in the news and hence assumes importance for the [UPSC Exam](#), especially in the disaster management, geography, and environment & ecology segments.

What is the Joshimath Issue?

Joshimath (also called Jyotirmath), located in the Chamoli district of the Himalayan state of Uttarakhand, is located in **seismic zone five** and bound by two regional thrusts: Vaikrita in the north and Munsiri in the south.

- The **1991 and 1999 earthquakes proved that the area is susceptible to [earthquakes](#).**
- Scientists from the Indian Institute of Remote Sensing, Dehradun, **observed that Joshimath and the surrounding areas have been sinking at a rate of 6.5 cm (2.5 inches) per year based on satellite data from July 2020 to March 2022.** Their findings correlate well with the base erosion of the Joshimath slope along the Alaknanda river.
- The city is located at an altitude of approximately 1875 m in the Middle Himalayas. It is also an important tourist and religious site, being close to the holy shrine of Badrinath, the Valley of Flowers National Park and Shri Hemkund Sahib, a holy place for Sikhism.

Reasons for Joshimath Crisis

The residents of Joshimath are alarmed over the unprecedented number of cracks appearing on roads, and commercial and residential buildings. People have been asked to vacate following fears of landslide and imminent disaster. Authorities have declared Joshimath a landslide and subsidence-hit zone.

- Experts have pointed out that Joshimath city has been built on an **ancient landslide material meaning it rests on a deposit of sand and stone, not rock**, which doesn't have high load-bearing capacity. This makes the area extremely vulnerable to ever-burgeoning infrastructure and population.
- Unplanned and unauthorised construction has led to the blocking of the natural flow of water, which eventually results in frequent landslides.
- The construction of NTPC's Tapovan Vishnugad Hydro Power Project is also seen as one of the reasons for the incident. It was found that the tunnel had water seepage from a punctured aquifer, leading to the drying of water sources in Joshimath.
- It may also be the result of the **reactivation of a geographic fault — defined as a fracture or zone of fractures between two blocks of rock — where the Indian Plate has pushed under the Eurasian Plate along the Himalayas.**

What is Land Subsidence?

Land subsidence is the sinking of the ground because of underground material movement. Subsidence can be caused by gradual settling or sudden sinking of the Earth's surface (National Oceanic and Atmospheric Administration (NOAA, USA)). The causes for subsidence generally are:

1. Natural causes - earthquakes, glacial isostatic adjustment, soil compaction, erosion, sinkhole formation, etc.
2. Resource extraction - extracting resources such as oil, water, minerals, natural gas, etc. from the ground by mining, fracking or pumping.
3. Construction of infrastructure - excess infrastructure load above the carrying capacity of the soil.

Mishra Committee (1976) Recommendation

This was a committee appointed in 1976, to look into why Joshimath is experiencing a sink. This committee made various recommendations in this regard:

- In the slip zone, no new construction should be undertaken. Construction should only be permitted once the site's stability has been assessed, and such regions should be appropriately investigated before being delineated.
- No trees should be chopped down within landslide-prone sites, nor should boulders be removed by excavating or blasting to repair roads or perform any other building activity.
- The region between Marwari (most affected during the recent incident) and Joshimath, below the Joshimath Reserve Forest, and in the cantonment should all undergo extensive planting.
- It was also highlighted that there should be a complete restriction on gathering building material within a radius of 3 to 5 kilometres of the Joshimath township.

Seismic mapping in India:



Image source - Maps of India.com

- The National Centre for Seismology under the Ministry of Earth Sciences is the nodal agency of the Government of India (GoI), for monitoring earthquakes in and around the country.
- As per the seismic zoning map of the country, the total area is classified into four seismic zones.
 - Zone V is seismically the most active region.
 - Zone II is the least.

- 11% of the country falls in zone V, 18% in zone IV, 30% in zone III and the remaining in zone II.

