

A Few Minutes Series

Subject - Environment & DM

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Joshimath Land Subsidence

Joshimath

- Joshimath, also known as Jyotirmath, is a city in Chamoli District in Uttarakhand.
- Joshimath is situated in the middle slopes of a hill bounded by the Karmanasa and Dhaknala streams on the west and the east and the Dhauliganga and Alaknanda rivers on the south and the north.
- Located at a height of 1875 m, it is a gateway to several Himalayan mountain climbing expeditions, trekking trails and pilgrim centres like Badrinath.
- This place can be a base station for travellers going to Guru Gobind Ghat or the Valley of Flowers National Park.
- It is home to one of the four cardinal pīthas established by Adi Shankara.
- It is also of great strategic importance to the Indian armed forces and is home to one of the Army's most important cantonments.

Location



Why in News?

- The town is confirmed to be sinking due to its geographic location being along a running ridge.
- Structures around the town developed cracks and town people had to be evacuated.
- Recently, it has been declared a landslide-subsidence zone and over 60 families living in uninhabitable houses in the sinking town have been evacuated to temporary relief centres.
- Since 7 February 2021, the area was severely affected by the 2021 Uttarakhand flood and its aftermath.

Is Joshimath sinking?

- Cracks on walls and buildings were first reported in 2021, as Chamoli district of Uttarakhand experienced frequent

landslides and flooding.

- As per reports, the Uttarakhand government's expert panel in 2022 found that several pockets of Joshimath are sinking owing to man-made and natural factors.
- Joshimath is sinking at a rate of 6-6.5 cm per year as per the satellite images.
- It was found that a gradual settling or sudden sinking of the earth's surface due to the removal or displacement of subsurface materials has induced structural defects and damage in almost all wards of the city.
- Land subsidence has been going on slowly in Joshimath for quite some time but it has increased over the past week with huge cracks appearing in houses, fields and roads.

Reasons

Geographical reasons -

Ancient landslide site -

- According to the 1976 Mishra Committee report, Joshimath is a deposit of sand and stone, it's not the main rock.
- It lies on an ancient landslide.
- The report added that undercutting by river currents of Alaknanda and Dhauliganga are also playing their part in bringing landslides.
- These rivers washes away debris and thus, start cutting the edges of mountains and inhabited area.

Prone to Earthquakes -

- Joshimath falls under the highest seismic hazard Zone V as it experiences continuous seismogenic stresses.

- Joshimath almost sits on the Vaikrita Thrust (VT), a tectonic fault line. The town is also very close to main geological fault lines, Main Central Thrust (MCT), and Pandukeshwar Thrust (PT).
- Seismic energy generation due to micro-earthquakes may have weakened the strength of the rocks as Joshimath is located in the earthquake rupture zone of the 1999 Chamoli earthquake, they said.
- Climatic factors such as excessive precipitation and flow of water from mountains into massive cracks and fractures in the sub-surface rocks lead to the widening of cracks and hastening the slip in rock material.
 - The impact of extreme rainfall events is visible in latest satellite data, which shows that mountain streams have expanded their channels and changed course, thereby inducing more slope instability in an already fragile belt.
- Scattered rocks in the area are covered with old landslide debris comprising boulders, gneissic rocks, and loose soil, with a low bearing capacity. These gneissic rocks are highly weathered and have a low cohesive value with a tendency of high pore pressure when saturated with water, especially during monsoons.

Improper water drainage -

- Experts and USDMA pointed out reasons for increase in ground seepage of water from surface, a probable cause for subsidence.
- First, on-surface anthropogenic activities have blocked natural water drainage systems, forcing water to find new

drainage routes.

- Second, Joshimath town does not have sewage and wastewater disposal system.
- The seepage reduces the shear strength of the overburden soil.

Construction Activities -

- **Increased construction, hydroelectric projects, and the widening of the NH have made the slopes highly unstable in the last couple of decades.**
- **Deforestation**

Way Ahead

- Restrictions should be placed on heavy construction work, blasting or digging to remove boulders for road repairs and other construction, felling of trees.
- A massive campaign to plant trees and grass be undertaken, agriculture on slopes be avoided, construction of a pucca drain system soaking pits be closed and sewage water flows through sewer line.
- Further, to avoid, percolation, water shouldn't be allowed to accumulate and drains should be constructed to carry it to safer areas and all cracks should be filled in with lime, local soil and sand.
- While the state already has weather forecasting technology that can warn people of local events, its coverage needs to be improved.
- The state government also needs to take scientific studies more seriously, which clearly can spell out the reasons for the current crisis.