

## LANDSLIDES: GEOGRAPHY

**NEWS:** Three soldiers killed, 6 missing as landslide hits Army camp in Sikkim

### WHAT'S IN THE NEWS?

A landslide triggered by heavy rainfall struck a military camp in Sikkim's Lachen district, causing casualties and property loss. India, being one of the world's most landslide-prone countries, faces increasing risks due to natural and anthropogenic factors despite institutional mitigation efforts.

#### Context

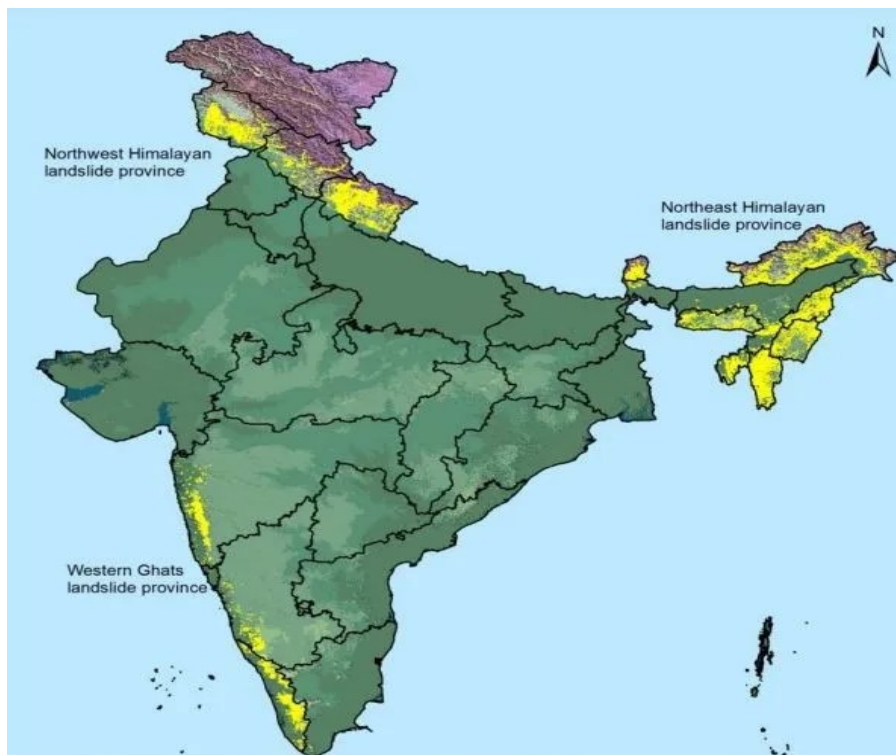
A landslide triggered by heavy rainfall hit a military camp in Sikkim's Lachen district causing casualties and property loss.

#### What is a Landslide?

Landslides are a geological phenomenon involving the sudden and rapid movement of a mass of rock, soil, or debris down a slope under the influence of gravity.

They usually occur in areas with certain characteristics:

- Steep terrain such as hilly or mountainous areas
- Presence of joints and fissures
- Regions where surface runoff is directed or where land is heavily saturated with water



## Causes of Landslides

### *Natural Causes*

- **Heavy Rainfall**
  - Most common trigger of landslides
  - Increases pore water pressure
  - Saturates the soil, increasing its weight and reducing cohesion
- **Erosion**
  - Clay and vegetation act as cohesive agents that hold particles together
  - Removal of cohesive elements through erosion destabilizes the slope
- **Earthquakes**
  - Intense ground shaking destabilizes rocks and soils
  - Causes slope failure and landslides
- **Volcanic Eruptions**
  - Deposition of ash and debris overloads slopes
  - Accompanied seismic activity triggers slope instability

#### *Anthropogenic Causes*

- **Deforestation**
  - Vegetation stabilizes soil and obstructs falling debris
  - Removal of vegetation increases vulnerability to landslides
- **Encroachment in Vulnerable Terrains**
  - Increasing human settlements and construction in hilly regions
  - Increases the load on unstable slopes and disrupts natural drainage
- **Uncontrolled Excavation**
  - Unauthorized and poorly planned mining and quarrying
  - Destabilizes slopes and alters natural slope balance

#### **Landslide Vulnerability in India**

- India is highly prone to landslides due to its tectonic position
- The Indian landmass moves northward at 5 cm/year accumulating tectonic stress
- India is among the top five landslide-prone countries globally

- **Extent of Vulnerability**
  - 12.6% of India's land area is vulnerable to landslides (excluding snow-covered areas)
  - 66.5% of vulnerable areas are in the north-western Himalayas
  - 18.8% are in the north-eastern Himalayas
  - 14.7% are in the Western Ghats region
- **Landslide Atlas of India**
  - Released by the Indian Space Research Organisation (ISRO)
  - Identifies the most vulnerable areas in the country

### **Measures taken by India**

- **Disaster Management Act, 2005**
  - Provides a legal and institutional framework for disaster management, including landslides
- **National Landslide Risk Management Strategy (2019)**
  - Covers all aspects of landslide disaster risk reduction and management
  - Includes hazard mapping, monitoring, and early warning systems
- **NDMA Guidelines on Landslide Hazard Management (2009)**
  - Outlines steps to reduce landslide risk
  - Provides guidelines for prevention, mitigation, and preparedness
- **National Institute of Disaster Management (NIDM)**
  - Provides capacity building, training, and support to national and state disaster management authorities
- **Landslide Hazard Zonation Maps (LHZM)**
  - Developed by the Geological Survey of India (GSI) and National Remote Sensing Centre (NRSC)
  - Identify landslide-prone areas
  - Used for safer land-use planning, infrastructure development, and disaster preparedness
- **Early Warning System**
  - Improved weather prediction through tools like the Ensemble Prediction System

- Enables timely prediction of disasters like landslides

## **Way Ahead**

- **Comprehensive Hazard Zonation**

- Regular updates of Landslide Hazard Zonation Maps
- Use of advanced tools like LiDAR, drones, and GIS-based techniques

- **Reforestation and Ecosystem Restoration**

- Conduct afforestation drives using native plant species
- Implement slope stabilization using bioengineering techniques

- **Climate-Responsive Adaptation**

- Develop localized strategies to cope with increased rainfall due to climate change
- Build resilient infrastructure
- Improve drainage systems to handle intense rainfall events

**Source:** <https://indianexpress.com/article/cities/kolkata/sikkim-landslides-3-soldiers-killed-6-missing-over-1600-tourists-evacuated-10043896/>