

DISASTER MANAGEMENT

Landslides

- A frequently used definition of landslide is “a movement of mass of rock, earth or debris down a slope
- A landslide can be classified and described by two nouns; the first describes the material and the second describes the movement. The material can be rock, debris and earth or a mix. The movement can be fall, topple, slide, spread and flow. Hence, a landslide can be named as rock fall (‘rock’ is the material type + ‘fall’ is the movement type), debris flow and so on.

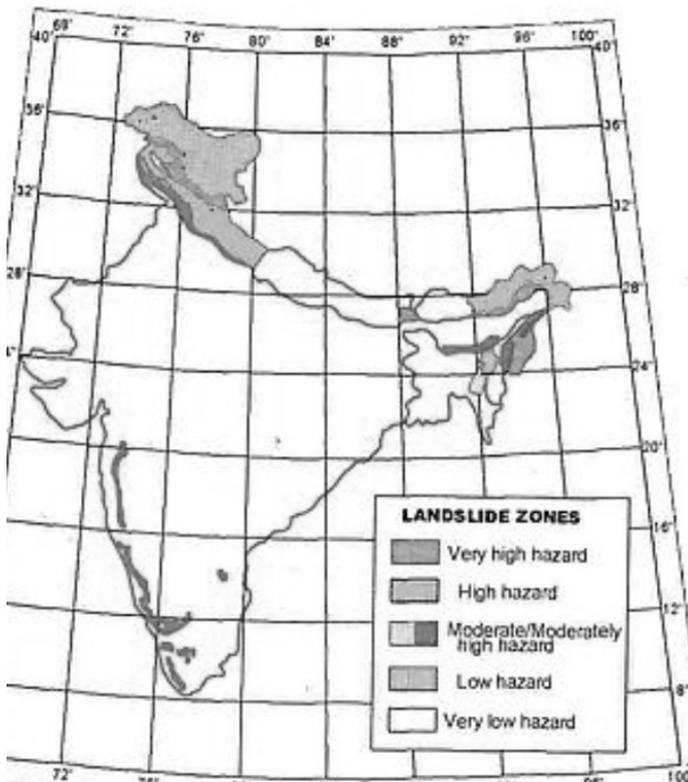
- Landslides have caused deaths in India, including 380 in 2021, 48 in 2021, and 25 in 2019. In 2014, there were nearly 500 deaths due to landslides
- In 2022, a landslide in Manipur killed 58 people, injured 18, and left three people missing. In 2023, landslides in Himachal Pradesh have killed at least 361 people and injured 342 others
- An international database of fatal landslides prepared by the University of Sheffield, England shows that with close to 11,000 deaths due to landslides in 12 years, India tops a global list of nearly 56,000 casualties from 4,800 landslides around the world between 2004 and 2016.

India's Vulnerability to Landslides

- As per the Geological Survey of India (GSI), about 0.42 million km² (covering nearly 12.6% of the land area of our country) is prone to landslides
- The mountainous region of the north-western Himalayas (Jammu & Kashmir, Himachal Pradesh, Uttarakhand), the sub-Himalayan terrain of the north-east (Sikkim, West Bengal-Darjeeling, Assam, Arunachal Pradesh, Manipur, Meghalaya, Mizoram, Nagaland, Tripura), the Western Ghat areas (Maharashtra, Goa, Karnataka, Kerala) and the Eastern Ghat areas (Araku area of Andhra Pradesh, Tamil Nadu) are prone to landslides.

State	Total no. of landslide events	State	Total no. of landslide events
Mizoram	12,385	Nagaland	2,132
Uttarakhand	11,219	Sikkim	1,569
Tripura	8,070	Himachal Pradesh	1,561
Arunachal Pradesh	7,689	Karnataka	1,904
Jammu and Kashmir	7,280	Tamil Nadu	690
Kerala	6,039	West Bengal	172
Manipur	5,494	Haryana	100
Maharashtra	5,112	Ladakh	23
Meghalaya	2,639	Goa	03
Assam	2,569	Total	80,933

Landslide hotspot areas in India (1998-2022). (Source: Landslide Inventory of India, Landslide Atlas of India, ISRO)



- India is considered among the top five landslide-prone countries globally, where at least one death per 100 sq km is reported in a year due to a landslide event.
- Rainfall variability pattern is the single biggest cause for landslides in the country, with the Himalayas and the Western Ghats remaining highly vulnerable.

Factors Responsible

- Natural causes that trigger it include heavy rainfall, earthquakes, snowmelting and undercutting of slopes due to flooding.
- Landslides can also be caused by anthropogenic activities such as excavation, cutting of hills and trees, excessive infrastructure development, and overgrazing by cattle.
- Generally, hilly regions are associated with slope instability and are prone to landslides. These are influenced by factors such as slope gradient, hill elevation, rock strength, forest cover, built-up area and unconsolidated and semi-consolidated sediments.
- Riverine flow, the cutting down of the toes of slopes and deforestation are some other factors that make a region vulnerable to landslides. Debris flow and underground water make a slope weak and landmass can slip down it.
- The convergence of the Indian plate with the Eurasian plate in the Himalayan region has created subterranean stresses that get released in the form of earthquakes which, in turn, cause fractures and loosen the litho-structures near the mountain surface. This increases the possibilities of rock movement along the slope.

Western Ghats:

- Man-made factors like deforestation, encroachment and haphazard land use and natural factors like heavy rainfall are regarded as some of the key contributing factors behind landslides in
- Factors like deforestation, blasting of hills, haphazard cutting of hill slopes and making changes in the natural drainage system are known to be the aggravating factors that prepares the foundation for a landslide.

Step taken So far:

ISRO Landslide Atlas

- Excluding snow covered areas, approximately 12.6 per cent of the country's geographical land area (0.42 million sq km) is prone to landslides.
- As many as 66.5 per cent of the landslides are reported from the North-western Himalayas, about 18.8 per cent from the North-eastern Himalayas, and about 14.7 per cent from the Western Ghats.
- Rudraprayag in Uttarakhand is at the top of 147 vulnerable districts.
- It has the highest landslide density in the country, along with having the highest exposure to total population and number of houses.

National Landslide Risk Management Strategy 2019:

- Landslide Hazard Zonation, Landslide Monitoring and Early Warning System, Awareness Programmes, Capacity Building and Training of Stakeholders, Preparation of Mountain Zone Regulations and Policies
- The strategy describes the formulation of land-use policies and techno legal regime, updation and enforcement of building regulations

Way forward:

- A Council of Himalayan States must be forged to gauge the impact of surface and subsurface stresses. It should try to simulate the hazard scenario caused by natural processes, environmental degradation or climate-induced phenomena, and anthropogenic activities in hill stations or towns.
- The disaster management authorities of the states should come together under the centralised council.
- Town planning must account for the idiosyncrasies of the mountain — heavy constructions should be barred, care should be taken to have a proper drainage system, slope cutting, if necessary, should be done scientifically, and emphasis should be on having retaining walls and adherence to building codes
- Afforestation can be done across the mountain slopes
- Making of walls to stop the materials from falling down towards the valleys
- Terrace farming can be promoted
- Environmental Impact Assessment of the New and existing projects to assess the threat of landslides posed by them