LANDSLIDE - GS III MAINS

Q. How human activities dominate the nitrous oxide emissions across the world and analyse the rising impact behind it. What measures need to be taken by the government across sectors to reduce its potential? (15 marks, 250 words)

News: *What causes landslides? Can we predict them to save lives?*

What's in the news?

- A devastating landslide struck several remote villages in the mountainous Enga province in Papua New Guinea late last week.

Key takeaways:

Landslide:

- A landslide is defined as the movement of a mass of rock, debris, or earth down a slope. Landslides are a type of "mass wasting," which denotes any down-slope movement of soil and rock under the direct influence of gravity.

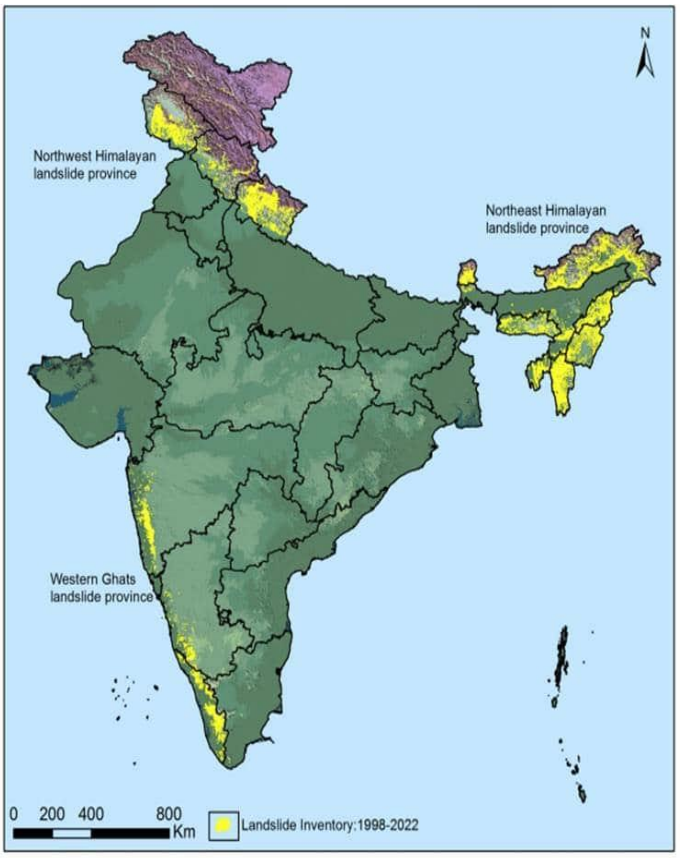
Types of Landslides:

Types of Landslides	Meaning
Topples	This occurs due to fracture in rocks. It causes tilting for gravitational pull without collapsing.
Falls	This involves the collapse of rocks or debris from a cliff or slope. It results in the collection of debris at the base of a hill.
Spread	It occurs in gentle slopes where soft debris or other materials are widely available.
Slides	It occurs when debris, rocks or soil slide through a slope.

Factors Influences Landslides:

- Lithology
- Geological structures like faults, hill slopes, drainage, geomorphology
- Land use and land cover
- Soil texture and depth
- Weathering of rocks

Landslide Profile of India:



- Landslides and avalanches are among the major hydro-geological hazards that affect large parts of India besides the Himalayas, the Northeastern hill ranges, the Western Ghats, the Nilgiris, the Eastern Ghats and the Vindhyans, in that order, covering **about 15 % of the landmass**.
- The Northeastern region is badly affected by landslide problems of a bewildering variety.
- Landslides in the **Darjeeling district of West Bengal as also those in Sikkim, Mizoram, Tripura, Meghalaya, Assam, Nagaland and Arunachal Pradesh** pose chronic problems, causing recurring economic losses worth billions of rupees.
- **Himalayas of Northwest and Northeast India and the Western Ghats are two regions of high vulnerability and are landslide prone.**
- The majority of the landslide-prone areas in India happen to be located in regions that are also earthquake prone. Thus, these areas are susceptible to earthquake-triggered landslides.
- As many as **66.5 percent of the landslides are reported from the North-western Himalayas, about 18.8 percent from the North-eastern Himalayas, and about 14.7 percent from the Western Ghats**.

Causes:

Natural Causes:

1. Heavy Rainfall:

- Landslides occur frequently in the Himalayan and other landslide-prone hilly areas in the country especially during the monsoon as a result of heavy rainfall.

2. Earthquakes:

- Sudden shaking of earth's crust due to earthquakes creates stress on materials, thus leading to landslides.

3. Snow Melting:

- The snowmelt water infiltrates into the soil ground over a long period. This results in a large amount of surface water which may trigger landslides and debris flows.

Anthropogenic Activities:

1. Excavation:

- Unplanned excavation of slopes for road and railway projects, rampant dumping of slope-excavated material, quarrying, mining and building construction besides 'modification' of and encroachment on natural drainage systems can cause a landslide.

2. Infrastructure Development:

- Due to high levels of unplanned infrastructure development in the mountainous regions, landslides.

3. Deforestation:

- Trees are cut for agricultural and industrial activities which loosens the soil grip and makes the region more vulnerable to landslides.

4. Mining:

- In mining times, the soil grip will be loosened and makes the region more susceptible to landslides.

Impacts of Landslides in India:

1. Economic Loss:

- It is estimated that economic loss due to landslides may amount to as much as 1% to 2% of the Gross National Product in India.

2. Disruption of Normal Activities:

- After effects of landslides will disrupt the normal activities of the region like transport disruption, food shortage, lack of access to healthcare facilities etc.

3. Loss of Lives:

- Landslides will cause lots of human and animal deaths.
- For example - in the last 7 years around 90 people have died due to landslides.

4. Decimation of Infrastructure:

- The force flow of mud, debris, and rocks as a result of a landslide can cause serious damage to property.
- Infrastructure such as roads, railways, leisure destinations, buildings and communication systems can be decimated by a single landslide.

Steps Taken by India in Recent Years:

1. Landslide Atlas of India:

- The Indian Space Research Organisation (ISRO) recently released the Landslide Atlas of India, a detailed guide identifying landslide hotspots in the country.

2. Bhukosh portal:

- Bhukosh web portal will have the landslide susceptibility maps and landslide inventory data of all landslide-prone areas in the country.

3. National Landslide Susceptibility Map:

- NLSM database is the most effective fundamental geo-information tool on a medium scale, which should be used and integrated with the infrastructure development and planning in hilly or mountainous areas of India.

4. National Landslide Risk Management Strategy:

It addresses all the components of landslide disaster risk reduction and management, which includes

- hazard mapping, monitoring, and early warning system, awareness programs,
- capacity building, training, regulations, and policies, stabilization and mitigation of landslides, etc.

Way Forward:

1. Early Warning System:

- The hazard zones have to be identified and specific slides to be stabilized and managed in addition to monitoring and early warning systems to be placed at selected sites.

2. Local Friendly Technology Development:

- Government should create technology solutions through application of artificial intelligence to minimize the impacts of landslides in the future; the technological solutions should be tailored keeping in mind their needs and requirements.

3. Integrating with Prone Zone Mapping:

- Integration of its national landslide susceptibility mapping (NLSM) with infrastructure development and planning in hilly or mountainous areas in the country can help avoid disasters and human fatalities,

4. Structural Measures:

- The structural measures involve **engineering works** for stabilization and control of landslides while non-structural measures emphasize on the identification and avoidance of landslide-prone areas through monitoring.