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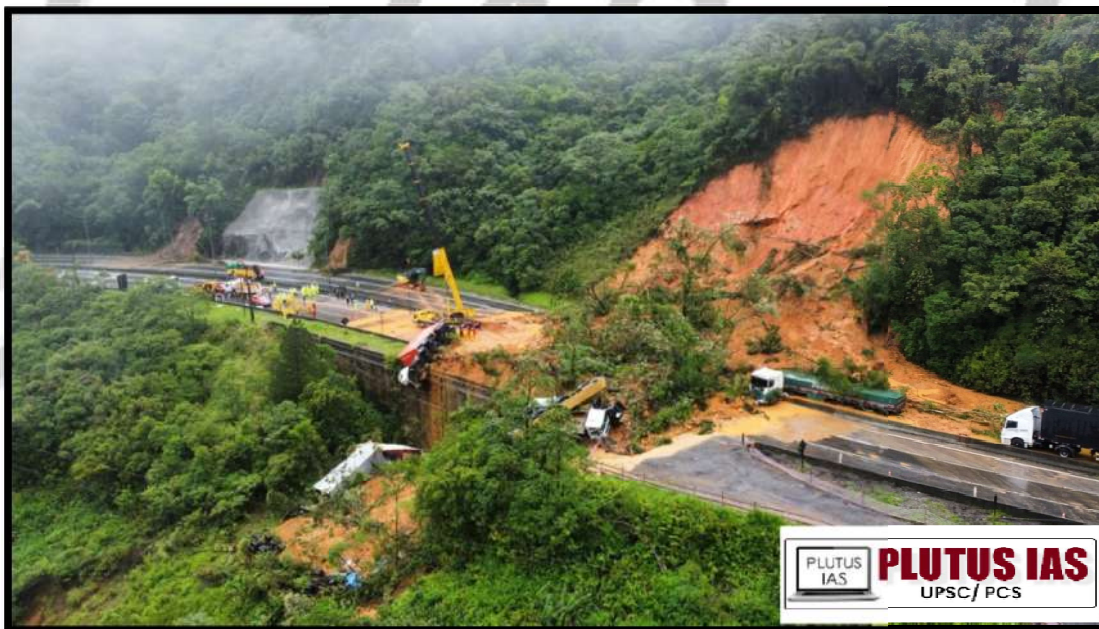
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LANDSLIDES IN THE MODERN WORLD: A GROWING ENVIRONMENTAL CHALLENGE

WHY IN THE NEWS?

The Union Cabinet has approved a Memorandum of Understanding (MoU) between the Geological Survey of India (GSI) and the Research Institute for Geo-Hydrological Protection of the National Research Council (CNR-IRPI) in Italy. This collaboration aims to advance landslide forecasting and early warning systems through joint research. The partnership will help enhance India's Landslide Early Warning Systems (LEWS), bringing them up to international standards. By improving prediction and mitigation capabilities, the MoU seeks to reduce landslide-related damages and prevent incidents like the Wayanad Landslide in Kerala.



WHAT IS A LANDSLIDE?

A **landslide** is the movement of rock, earth, or debris down a sloped section of land. It occurs when factors such as rain, earthquakes, or volcanic activity make the slope unstable. Geologists often refer to landslides as a type of mass wasting, which is the downward movement that wears away Earth's surface. Other types of

mass wasting include rockfalls and the flow of shore deposits called alluvium. Landslides pose significant hazards to people and property, especially near populated areas.

TYPES OF LANDSLIDE:

1. Falls: This type of landslide involves the collapse of material from a cliff or steep slope, resulting in the material falling down the slope and collecting near the base.

2. Topples: In this type of landslide, the falling mass undergoes forward rotation and movement around an axis or point at or near the base.

3. Slides: This type of landslide involves a distinct zone of weakness that separates the moving material from a more stable underlying material. There are two main types of slides:

Rotational Slide: The surface of rupture is curved concavely upward, and the slide movement is rotational about an axis parallel to the ground surface and transverse across the slide.

Translational Slide: The landslide mass moves along a roughly planar surface with little rotation or backward tilting.

4. Flows: This type of landslide involves the movement of material down a slope in the form of a fluid. There are three main types of flows:

Mud Flow: The movement of wet material, mostly composed of sand, silt, and clay-sized particles.

Debris Flow: A combination of loose soils, rocks, and organic matter with water forms a slurry that flows down a slope.

Rock Flow or Rock Avalanches: A specific type of landslide involving the flow of rock material downslope.

CONTRIBUTING FACTORS FOR LANDSLIDES:

1. Water: Water is a major trigger for landslides, as it reduces the friction between bedrock and sediment, making it easier for gravity to pull debris downhill.

2. Earthquakes: Earthquakes can shake the ground and destabilize slopes, leading to landslides.

3. Human Activity: Human activities such as deforestation, mining, urbanization, and poor construction practices can disturb the natural stability of slopes, increasing the risk of landslides.

4. Volcanic Eruptions: Volcanic eruptions can cause landslides, especially when the eruption leads to the sudden release of material or the destabilization of nearby slopes.

5. Erosion: Erosion, particularly caused by water or wind, can weaken the earth's surface, making slopes more prone to sliding.

6. Climate: Climatic factors, such as heavy rainfall, droughts, or temperature fluctuations, can influence the stability of slopes and contribute to landslides.

7. Geological Conditions: Geological conditions, such as the type of soil, rock layers, and fault lines, can determine how susceptible an area is to landslides.

CONSEQUENCES OF LANDSLIDE:

1. Loss of Life: Landslides can result in fatalities, especially in populated areas, due to the sudden and destructive nature of the event.

2. Damage to Infrastructure: Buildings, roads, bridges, and other infrastructure can be severely damaged, disrupting transportation and communication networks.

3. Economic Losses: The destruction of property, businesses, and agricultural land leads to significant financial costs and long-term economic hardship.

4. Environmental Impact: Landslides can alter landscapes, cause erosion, and damage ecosystems, disrupting local biodiversity and water systems.

5. Displacement of Communities: Entire communities may be forced to evacuate or relocate due to the destruction or risk of future landslides, leading to social and economic disruption.

NDMA GUIDELINES FOR LANDSLIDES:

- 1. Prepare:** Identify areas at risk for rockfalls and subsidence before travelling in hilly regions.
- 2. Stay Alert:** Listen for unusual sounds like rocks falling, trees cracking, or moving debris. Be cautious during heavy rainfall and move to safer locations if your home is near potential debris areas.
- 3. Stay Informed:** Follow weather warnings and ensure you have a communication plan during emergencies.
- 4. Stay Safe:** Avoid construction in vulnerable areas like steep slopes or drainage paths. Refrain from touching loose debris or exposed electrical wiring.
- 5. Help Others:** Assist those in need, particularly children, women, and the elderly, and call for rescue teams when necessary.
- 6. Report Damage:** Notify authorities about any damage to infrastructure like roads, power lines, or telephone systems.
- 7. Seek Advice:** Consult local authorities for guidance on rebuilding or repairing damaged properties, roads, and infrastructure.

WAYS TO REDUCE LANDSLIDE DISASTER AND ITS IMPACTS:

- 1. Identify and Restrict Construction in Landslide-Prone Areas:** Develop hazard maps to pinpoint high-risk areas and restrict development in these zones.
- 2. Build Protective Structures:** Install retaining walls, rock anchors, and soil nails to secure slopes and prevent falling debris.
- 3. Plant Trees and Vegetation:** Use trees and plants as natural barriers to stabilize soil and reduce landslide risks.
- 4. Educate the Community:** Conduct awareness campaigns and training for local communities and disaster response teams.
- 5. Create an Emergency Plan:** Prepare a family emergency plan, including evacuation routes and shelter locations. Register for community warning systems.
- 6. Stay Alert:** During heavy rainfall, listen for warning signs like cracking trees or rolling rocks. Avoid areas at risk of landslides or debris flows.
- 7. Use Chemical Agents:** Apply soil stabilizers and chemical agents to enhance slope stability and reduce erosion.
- 8. Divert Debris Pathways:** Reroute surface and subsurface drainage to prevent debris accumulation in vulnerable areas.

CONCLUSION

The Union Cabinet has approved an MoU between the Geological Survey of India (GSI) and Italy's CNR-IRPI to enhance landslide early warning systems in India, aiming to reduce damage and prevent disasters like the Wayanad Landslide. Landslides are caused by factors like rain, earthquakes, and human activity and can result in fatalities, infrastructure damage, and environmental harm. Key types include falls, slides, and flows. The National Disaster Management Authority (NDMA) advises preparedness, awareness, and quick response to reduce risks. Measures like hazard mapping, protective structures, and community education are crucial for minimizing landslide impacts.

PRELIMS QUESTION:

Q. Which of the following are types of landslides?

- Mudflow
- Rockfall
- Landslip

D. Slide

Select the correct answer using the codes given below:

A. 1, 2, and 4 only

B. 1, 2, and 3 only

C. 1, 3, and 4 only

D. 2, 3, and 4 only

Answer: A

MAINS QUESTION:

Q. Discuss the significance of the MoU between the Geological Survey of India and the Research Institute for Geo-Hydrological Protection of Italy. How can such collaborations enhance landslide forecasting and early warning systems in India? (250 words, 15 marks)

Ritik singh

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