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Q18

Disaster preparedness is the first step in any disaster management process. Explain how hazard zonation mapping will help disaster mitigation in the case of landslides.

UPSC Civil Services Mains 2019 · GS III · 15 marks · Disaster Management

Disaster and disaster management.

Core demand of the question

- Explain disaster preparedness as the first step in disaster management
- Show how landslide hazard zonation mapping helps mitigation
- Name GSI, NDMA, and Indian hill examples

Revision summary

Disaster preparedness is maps, rules, stocks, and drills before the event; for landslides it is the first real step.

GSI zonation classifies slopes using geology, slope, rain, land use, and slide history.

Mitigation uses the map to avoid red zones, regulate building, target engineering, and warn the right hamlets.

Himalaya, North-East, Western Ghats, and Konkan are the main Indian belts.

Public GIS maps must bind municipal permission and hill-road design, not stay in a report.

Introduction

Disaster preparedness is knowing the hazard, the exposure, and the drill **before** the slope moves or the river rises. It is the first step because rescue after a landslide is slow on a broken Himalayan road, and the dead cannot use a relief camp. **Hazard zonation mapping** draws **where** landslides are likely and **how severe** they may be. That map is what lets mitigation become **land-use, drainage, and warning**, instead of a speech after the houses have gone.

Body

Preparedness as the first step

- The disaster-management cycle is **prevention, mitigation, preparedness, response, recovery**. Preparedness is the hinge: plans, maps, stocks, trained people, and public awareness that make the later steps possible.
- The **Disaster Management Act, 2005** and **National Disaster Management Authority (NDMA)** guidelines put **hazard, vulnerability, and risk assessment** at the front. Without that, a State Disaster Management Plan is a list of phone numbers.
- **For landslides, preparedness means:** a zonation map, building rules that follow it, drainage and slope works in amber zones, relocation from red zones, **early warning** (rainfall thresholds, sensors), and community drills. Response (NDRF, SDRF) still matters; it cannot substitute a house built on a debris fan.

What landslide hazard zonation mapping is

- The **Geological Survey of India (GSI)** and partner agencies prepare **macro, meso, and micro** zonation: from regional susceptibility to site-specific slope maps.
- Inputs typically include **slope angle and aspect, lithology and structure, soil depth, land use and land cover, drainage, rainfall intensity, seismicity, and past slide inventory**.
- Output is usually classes such as **low, moderate, high, and very high** (or similar colour bands). **BIS** standards and **NDMA landslide guidelines** tell States how to use those classes in planning.
- Mapping is not a one-time poster. Roads, hydropower cuts, and climate-heavier cloudbursts **change** susceptibility; maps need update after major events and after new hill cutting.

How the map helps mitigation

- **Avoidance:** refuse or strictly condition construction, schools, and hydropower camps in very high hazard zones. This is the cheapest mitigation.
- **Regulation:** hill municipal bye-laws and **town-and-country planning** can ban multi-storey loads on red slopes and demand retaining and drainage on amber slopes.
- **Engineering targeting:** limited public money for **check walls, rock bolts, catch drains, and bio-engineering** goes first to high-hazard inhabited stretches and strategic roads (for example hill National Highways).
- **Early warning:** couple zonation with **India Meteorological Department** rainfall thresholds and local piezometers; evacuate only the mapped catchments, not an entire district blindly.
- **Insurance and relief norms:** premia and ex-gratia can reflect mapped risk so reconstruction is not repeated on the same scar.
- **Environmental clearance and road alignment:** the map should sit in **EIA** for hill roads and dams so a new cut does not create the next slide.
- **Community mitigation:** local people can mark springs and old scars; the scientific map plus **panchayat memory** is stronger than either alone.

Indian context

- Landslide risk is concentrated in the **Himalaya, North-East, Western Ghats, and Konkan / Nilgiri** belts. **Kedarnath 2013**, later Kerala hill events, and repeated slides on **NH corridors** in Uttarakhand, Himachal, and the North-East show the cost of building without a map.
- **National Landslide Risk Management Strategy** and GSI's national programme aim at coverage; many inhabited micro-slopes are still unmapped at the scale a gram panchayat can use.
- **Recommendations:** finish **inhabited micro-zonation**, put maps on a **public GIS**, bind **building permissions** to them, maintain **hill drainage** as a yearly budget line, and stop unscientific **road widening** that steepens toes of slopes.

Flow diagram

Preparedness first -> Landslide hazard zonation
GSI NDMA BIS NDMA BIS -> Landslide hazard zonation
Landslide hazard zonation -> Avoid red slopes
Landslide hazard zonation -> Drainage retaining works
Landslide hazard zonation -> Rainfall early warning
Avoid red slopes -> Mitigation
Drainage retaining works -> Mitigation
Rainfall early warning -> Mitigation

Conclusion

Preparedness is first because a landslide is won or lost in land-use years before the rain. Hazard zonation mapping by GSI and partners tells the planner which slopes to leave, which to engineer, and whom to warn. Mitigation then becomes avoidance, drainage, targeted works, and drills. Without the map, hill development is a bet against gravity.

Facts & figures

DM Act 2005

Disaster Management Act that created NDMA/SDMA structures and treats planning and preparedness as legal duties.

GSI zonation

Geological Survey of India landslide susceptibility maps at macro to micro scales for hill and ghats terrain.

NDMA landslide guidelines

National guidance on investigation, zonation, land-use, and structural and non-structural mitigation.

Kedarnath 2013

Uttarakhand disaster where rainfall, debris flows, and unwise construction in a high-hazard valley combined.

BIS codes

Bureau of Indian Standards practices for landslide control and hill construction that should follow zonation classes.

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