

**Disaster Management of Landslides : A Case Study of
Indian Hilly Regions.**

Subject: Geography

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➤ **Landslides**

The term “**landslide**” refers to the **downward movement of masses of rock and soil**. Landslides are caused by one or a combination of the following factors: change in slope gradient, increasing the load the land must bear, shocks and vibrations, change in water content, ground water movement, frost action, weathering of shocks, removal or, changing the type of vegetation covering slopes.

Landslide hazard areas occur where the land has certain characteristics which contribute to the risk of the downhill movement of material. These characteristics include:

- i. A slope greater than 15 percent.
- ii. Landslide activity or movement occurred during the last 10,000 years.
- iii. Stream or wave activity which has caused erosion, undercut a bank or cut into a bank to cause the surrounding land to be unstable.
- iv. The presence or potential for snow avalanches.
- v. The presence of an alluvial fan which indicates vulnerability to the flow of debris or sediments.
- vi. The presence of impermeable soils, such as silt or clay, which are mixed with granular soils such as sand and gravel.

Landslides can also be triggered by other natural hazards such as rains, floods, earthquakes, as well as human-made causes, such as grading, terrain cutting and filling, excessive development, etc. Because the factors affecting landslides can be geophysical or human-made, they can occur in developed areas, undeveloped areas, or any area where the terrain has been altered for roads, houses, utilities, buildings, etc.

➤ **Disaster**

- The term disaster owes its origin to the French word “**Desastre**” which is a combination of two words ‘**des**’ meaning bad and ‘**aster**’ meaning star. Thus the term refers to ‘Bad or Evil star’. A disaster can be defined as “A serious disruption in the functioning of the community or a society causing wide spread material, economic, social or environmental losses which exceed the ability of the affected society to cope using its own resource.
- A disaster is a result from the combination of hazard, vulnerability and insufficient capacity or measures to reduce the potential chances of risk.

- A disaster happens when a hazard impacts on the vulnerable population and causes damage, casualties and disruption. Fig. would give a better illustration of what a disaster is. Any hazard - flood, earthquake or cyclone which is a triggering event along with greater vulnerability (inadequate access to resources, sick and old people, lack of awareness etc) would lead to disaster causing greater loss to life and property. For example; an earthquake in an uninhabited desert cannot be considered a disaster, no matter how strong the intensities produced.

➤ **Types of Disaster**

- Natural
- Man-Made

Natural

- Cyclone, hurricane, typhoon
- Earthquakes
- Tsunamis
- Landslides
- Storms
- Floods

Man made

- An airplane crash,
- A major fire,
- Oil spill,
- Epidemic,
- Terrorism, etc.

➤ Causes of landslides

There are several causes of landslide. Some of the major causes are as follows:

1. Geological Weak Material: Weakness in the composition and structure of rock or soil may also cause landslides.

2. Erosion: Erosion of slope toe due to cutting down of vegetation, construction of roads might increase the vulnerability of the terrain to slide down.

3. Intense Rainfall: Storms that produce intense rainfall for periods as short as several hours or have a more moderate intensity lasting several days have triggered abundant landslides. Heavy melting of snow in the hilly terrains also results in landslide.

4. Human Excavation of slope and its toe, loading of slope/toe, draw down in reservoir, mining, deforestation, irrigation, vibration/blast, Water leakage from surface.

5. Earthquake shaking has triggered landslides in many different topographic and geologic settings. Rock falls, soil slides and rockslides from steep slopes involving relatively thin or shallow dis-aggregated soils or rock, or both have been the most abundant types of landslides triggered by historical earthquakes.

6. Volcanic eruption deposition of loose volcanic ash on hillsides commonly is followed by accelerated erosion and frequent mud or debris flows triggered by intense rainfall.

Major Landslides:

July 1991 ASSAM 300 people killed heavy loss to roads and infrastructure.

Aug 1993 NAGALAND 500 killed and more than 200 houses destroyed and about 5 kms road damaged.

18th Aug 1998 MALPA 210 people killed villages are washed away.

Adverse Effects:

The most common elements at risk are the settlements built on the steep slopes, built at the toe and those built at the mouth of the streams emerging from the mountain valley. All those buildings constructed without appropriate foundation for a given soil and in sloppy areas are also at risk. Roads, communication lines are vulnerable.

➤ Disaster Management

Is a systematic process (i.e., is based on the key management principles of planning, organising, and leading which includes coordinating and Controlling).

Aims to reduce the negative impact or consequences of adverse events (i.e., disasters cannot always be prevented, but the adverse effects can be minimised)

Disaster management cycle



Steps in disaster management of landslides

- Pre-disaster studies
- Post disaster

PRE-DISASTER STUDIES

- Includes landslide hazards zonation mapping are the different parts of the country
- Assessment of the slope stability aspects at the sites of different infra structural facilities
- Landslide hazards zonation on macro (1:50000 or 1:25000 scale) and meso (1:10000 or 1: 5000 scale) has been taken by the geological survey of India.
- Efforts are made to use GIS and data mapping tools are made
- Landslides zonation mapping in parts of Ravi Basin, Himachal Pradesh, Yamuna Basin Uttrakhand, Imphal, Manipur, Kohima, Nagaland, Cachar , Mezoram,
- Landslides hazard zonation in macro scale includes Guwahati Assam, Kannur area Idukki Kerala Nilagiri.

Areas covered by degraded natural vegetation in upper slopes are to be afforested with suitable species.

Existing patches of natural vegetation (forest and natural grass land) in good condition, should be preserved. Any developmental activity initiated in the area should be taken up only after a detailed study of the region has been carried out.

In construction of roads, irrigation canals etc. proper care is to be taken to avoid blockage of natural drainage Total avoidance of settlement in the risk

zone should be made mandatory. Relocate settlements and infrastructure that fall in the possible path of the

Post Disaster Studies

- The post-disaster studies were governed by the emerging disaster management scenario. These include 1) development and updating of inventory data bases (of existing landslide incidences) on a continuing basis, 2) quick response to landslide incidences, 3) preliminary assessment and detailed studies of existing disastrous or potentially disastrous landslides posing danger to habitations and 4) infrastructural elements and other civil projects.

Post Disaster Studies (Landslides)

- The landslides information reporting preformed was developed for reporting Occurrence landslides to the DMS Control room GSI New Delhi
- Landslide pre study include reconnoitre studies followed by detailed analysis, preliminary monitoring of a few landslides and efforts to stabilize the disasters landslides
- The preliminary/ reconnoitre studies of specific slides were carried out - to assess the magnitude, suggest remedies and identified slides that required detail study
- The work carried out included 34 incidents in HP, 65 in Uttarakhand, 20 in Jammu Kashmir, 111 in West Bengal, 4 in Guwahati -Assam, 6 in Manipur.

Recent Developments in Disaster Management in India

1. Three major disasters during recent times includes Northern Himalayan landslides Aug 1998, super cyclone on 1999 Orissa, Uttarakhand earthquake 2001, led to sea level changes.

3. Aug 1999, high power committee reviewed the disaster management in the country. In the year 2004 –mitigation, prevention, preparedness in case of disaster management and all related activities

Landslides in India (GSI)

- India is vulnerable to different natural hazards due to its proximity to geodynamically active and unique climatic pattern.
- It is estimated that about 60 % of the landmass of the country is vulnerable to earthquakes of different magnitude, and 15% of the total area of the country is susceptible to landslides
- The severity of natural disaster in our country is indicated by the estimate of the ministry of home affairs which indicate in the decade 1990-2000 annually, an average of 4344 people lost their life and 30 million people are affected by the disaster.

Possible risk reduction measures:

- Hazard mapping locates areas prone to slope failures. This will help to avoid building settlements in such areas. These maps will also serve as a tool for mitigation planning.
- Areas covered by degraded natural vegetation in upper slopes are to be afforested with suitable species.
- Any developmental activity initiated in the area should be taken up only after a detailed study of the region has been carried out.
- In construction of roads, irrigation canals etc. proper care is to be taken to avoid blockage of natural drainage
- Total avoidance of settlement in the risk zone should be made mandatory.
- Relocate settlements and infrastructure that fall in the possible path of the landslide
- No construction of buildings in areas beyond a certain degree of slope Retaining Walls can be built to stop land from slipping (these walls are commonly seen along roads in hill stations). These are constructed to prevent smaller sized and secondary landslides that often occur along the toe portion of the larger landslides.

Conclusion

- Landslides are one of the major disaster which effects 15% of the landmass.
- It leads to destruction of life and property.
- Disaster management of landslides is a very important step towards reducing the effects of the event.
- Disaster management should be practiced by all individuals as well as community in pre, post disaster situations.