Government of Jammu & Kashmir
Higher Education Department

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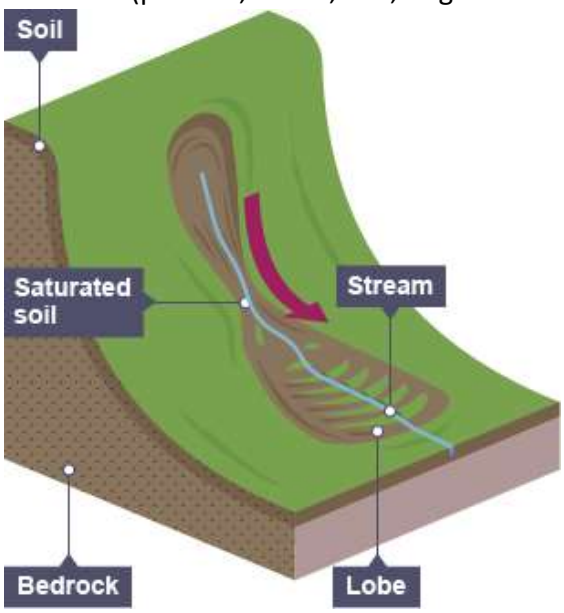
VIDEO LINK
https://youtu.be/xHekVyzIFZw
https://www.youtube.com/watch?v=mknStAMia0Q

2.4.6 MUDFLOW

I. INTRODUCTION:

Mud flows are rapidly flowing mass of wet material that contains at least 50 percent sand, silt and clay- sized particles. A mud flow (unconfined debris flow, often referred to as slope failure or slope-type debris flow) is a fast moving mixture of debris (pebbles, wood, soil, vegetation cover) and water originating on a steep slope. Superficial landslides sometimes trigger slope failures, however, very often there is no clear sliding surface present.



A mudflow is a process in which gravel, boulders and rocks, mixed with clay and water, move readily, almost like a liquid, down a slope. A variety of other terms like debris flow, debris avalanche, mud avalanche, lahar, rocky mudflow, mudslide, earthflow, etc. have also been used to describe this phenomenon.

Mudflows are very rapid and often occur after heavy rain

- Soil is saturated and turns to mud
- It can also occur after volcanic activity

Mudflows can be generated in any climatic regime but are most common in arid and semiarid areas. They may rush down a mountainside at speeds as great as 100 km (60 miles) per hour and can cause great damage to life and property. Boulders as large as houses have been moved by mudflows. In urban settings such as Burbank, large debris flows usually only occurs when the hillsides are denuded following wilfires. Wildfires burn the vegetation and damage the root systems that help hold the soil in place during storms.

Conditions required for producing a Mud Flow

The source area of a debris flow must have:

1) a very steep slope,

2) an abundant supply of loose debris,

3) a source of abundant moisture, and

4) sparse vegetation.

II. CAUSES OF MUDFLOW

Mudflows occur on steep slopes where vegetation is not sufficient to prevent rapid erosion but can occur on gentle slopes if other conditions are met. Other factors are heavy precipitation in short periods and an easily erodible source material.

Debris flows or mudflows can be triggered by many different situations like:

1. **Addition of Moisture:** A sudden flow of water from heavy rain, or rapid snowmelt, can be channelled over a steep valley filled with debris that is loose enough to be mobilized. The water soaks down into the debris, lubricates the material, adds weight, and triggers a flow.

2. **Removal of Support:** Streams often erode materials along their banks. This erosion can cut into thick deposits of saturated materials stacked high up the valley walls. This erosion removes support from the base of the slope and can trigger a sudden flow of debris.

3. **Failure of Ancient Landslide Deposits:** Some debris flows originate from older landslides. These older landslides can be unstable masses perched up on a steep slope. A flow of water over the top of the old landslide can lubricate the slide material, or erosion at the base can remove support. Either of these can trigger a debris flow.

4. **Wildfires or Timbering:** Some debris flows occur after wildfires have burned the vegetation from a steep slope or after logging operations have removed vegetation. Before the fire or logging, the vegetation's roots anchored the soil on the slope and removed water from the soil. The loss of support and accumulation of moisture can result in a catastrophic failure. Rainfall that was previously absorbed by vegetation now runs off immediately. A moderate amount of rain on a burn scar can trigger a large debris flow.

5. **Volcanic Eruptions:** A volcanic eruption can flash melt large amounts of snow and ice on the flanks of a volcano. This sudden rush of water can pick up ash and pyroclastic debris as it flows down the steep volcano and carry them rapidly downstream for great distances. In the 1877 eruption of Cotopaxi Volcano in Ecuador, debris flows travelled over 300 kilometres down a valley at an average speed of about 27 kilometres per hour. Debris flows are one of the deadly "surprise attacks" of volcanoes.

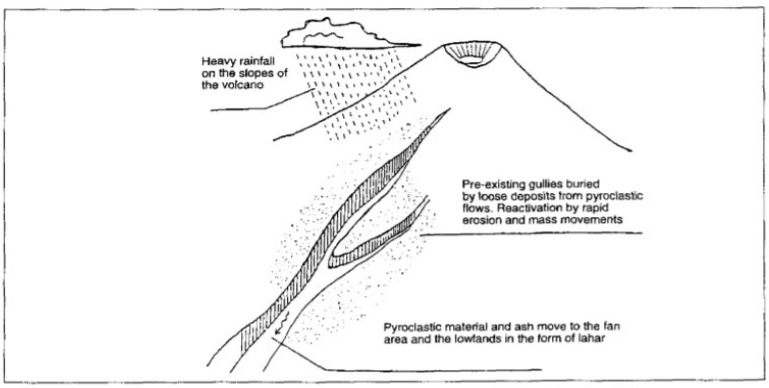


FIGURE 2.1 Lahar formation in pre-existing valleys filled with pyroclastic deposits (modified from Supangkat, 1989).

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III. DEBRIS FLOW EARLY-WARNING SYSTEMS

Debris flows can be very dangerous. They can move at high speeds, travel long distances, and fill stream valleys up to 100 meters deep with debris. Early warning systems are being developed for use in areas where debris flow risk is especially high. One method uses sensitive seismographs to detect debris flows that have already started moving. Another uses radar precipitation estimates and established rainfall intensity-duration threshold values to determine when meteorological conditions are right for flows to occur.

Measures against mud flows

Personal measure

- Avoidance of exposed slopes and their deposition zones (in particular in the case of heavy precipitation events).

Technical measures

- Construction of deflection structures (training dikes, wedge-shaped structures, mounds)
- Construction of reinforced walls facing slopes
- Avoidance of openings in buildings facing slopes or location of such openings at a sufficient height above the surface of the terrain.

IV REFERENCES

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