# A Study on Landslide at Malin in Pune

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# Introduction

- Landslides are natural hazards frequently occurring in mountainous and hilly regions and cause adverse effects on human lives and economy.
- The frequency of landslide is maximum during the monsoon period from July to September and after snowfall from January to March.
- Sometimes, landslide occurred due to strong earthquakes and volcanic activities.

## Causes of Land slide

(1) Heavy rainfall
(2) Earthquakes
(3)Forest fires
(4) Volcanoes
(5)Dangerous human activities like quarrying, mining etc

## Factors influencing to slides

(1) slope angle
(2) weathering
(3) over loading
(4) vegetation
(5) climate
(6) water content
(7) geology
(8) slope stability etc

# Objective of the study

- Analyze the geotechnical aspects of the catastrophe occurred at Malin, Pune in July, 2014.
- Make an attempt to pinpoint the causes and suggest some preventive/ precautionary measures to minimize the impact of landslides.

https://www.youtube.com/watch?v=4kMAy5FkuY4
https://youtu.be/zjB75Ievndk

# Case study: Landslide in Pune

- In July 30, 2014 a major landslide occurred at Malin located at 110 km from Pune city, in the Western Ghats.
- Bundle of mud and debris that came down from a nearby hillock, swallowed up almost the entire tribal village.
- The landslide, which hit early in the morning while residents were asleep, was believed to have been caused by a burst of heavy rainfall, and killed nearly 151 people.
- Due to the remoteness of the village, the tragedy came to light only when the driver of the first state transport bus reached the village a little after 7.30 am to find it uprooted

# Geographical Background of Malin Before landslide

- Malin village is situated in western ghat which is a UNESCO World Heritage Site and is one of the eight “hottest hotspots” of biological diversity in the world.
- Basalt is the predominant rock found in the hills. Malin falls to the foothill of Sahyadri Mountain range.
- The region has heavy rainfall during south-west Manson, average rainfall of 1171 mm.
- Commonly cultivated crops in the region are rice and finger millet.

# Culprits of Landslide

Malin is identified as one of the ecologically sensitive areas in the Western Ghats by the Kasturirangan committee in its report on Western Ghats. Based upon the literature available the following were found to be the causes of the landslide at Malin.

**1. Very Heavy Rainfall**

The region was receiving particularly very heavy rainfall in the week between 25th to 31st July. The continuous heavy rainfall saturated the soil along the slope of the village.

This developed as loose mud and eventually flowed down after gaining momentum, sweeping terraces, walls and ultimately the houses in the village.

## 2. Deforestation and Leveling of Land on the Hill for Cultivation

- The area around Malin has been deforested extensively.
- More than 25000 trees were cut to make way for farming, construction and mining .
- Flattening of hill slopes were also done to develop cultivable plots.
- Land was leveled by uprooting trees.
- No measures were taken to control erosion and to allow drainage.
- Due to the above hilltop had become unstable.

## 3. Change in Agriculture Practice

- Villagers had recently shifted from cultivation of rice and finger millet to wheat, which required flattening of steep areas, which contributed to instability of the hills.
- Improper land use practices such as heavy tilling, improper agricultural practices etc lead to excessive erosion.

## 4. Backwater of Dimbhe Dam

Construction of Dimbhe Dam ten years ago may be one of the reasons of landslide. The Malin village falls in a backwater zone of Dimbhe Dam.

## 5. Human Interference in Nature

- Stone quarrying activities in the area may loosen the rocks and rain water impounded in the cavities may cause sudden land slides.
- Slope cutting for construction are common in the inhabited areas of the hilly terrain.
- Slopes are cut without any slope stability analysis and adopting necessary preventive measures.
- Construction of dams, deforestation and the spread of unregulated buildings along riverbanks magnify the impact of the monsoons.

# Prospective Mudslides

- Human interference is one of the major reasons behind the landslide. Hence we should give a special attention towards it.
- Like Malin there are so many areas in western ghat region where human activities caused considerable damage to environment.
- This damage may cause the same condition as like Malin in future.

# Mitigation of Landslide

Mitigation or prevention of landslide is not so good for environment. Landslide is a natural process and we should try to prevent it in an ecofriendly manner.

**1. Land Assessment**

To determine what areas are prone to landslides

**2. Slope Stabilization and Development**

- Slope failures, or landslides, more predominantly occur in steep slopes.
- By slope stabilization and drain control improvement the probability of landslide can be reduced.

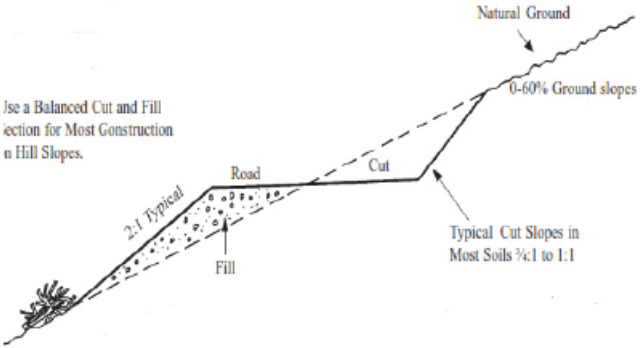


Figure: Balanced cut and fill Stabilization using vegetation

## 3. Prepare Slope Stability Maps

Slope stability maps shall be prepared which will help in identifying the zones prone to landslides

## 4. Prepare Landslide Inventory Database

An authority must prepare a database of all the past landslides in the surroundings.

- Slope-Magnitude, length and Direction
- Soil thickness
- Relative relief
- Land use
- Drainage- pattern and density
- Landslide affected population

## 5. Redirect Debris Channel.

Debris channel shall be safely redirected away from habitation zone. Local residents shall be made aware about the evacuation plan and not to block the redirected channels.

## 6.Vegetation

Vegetation helps in stabilizing the slopes in numerous ways.

# Precautionary Measures

The best option to prevent the occurrences of such landslides would be to create awareness among the people by organizing programs that explain the basics of good hill slope development and management practices in the simplest and generalized way.

# Alert Systems

Rainfall data across the country gets recorded at many centers, efforts shall be taken to devise a program which can generate alerts for prospective landslides.

# Conclusion

- Landslides are common in the area during monsoon season, which runs from June through September.
- The area around the village has been deforested extensively, increasing its vulnerability to landslides.
- Similar deforestation and environmental damage have caused floods and landslides in other parts of India.

# References


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# Thank You