

Investigation of Landslide prone areas in Idukki District, Kerala, India

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Abstract - Landslides are a serious geological hazard common in hilly regions. It causes extensive damage to roads, bridges, human dwellings, agricultural lands, orchards, forests etc. resulting in loss of property as well as life. Economical degradation of hill areas has also been on the increase due to greater frequency of occurrence of landslides. Idukki district is most susceptible to landslides during monsoon season. Most of our National highways may be blocked due to heavy landslide in the monsoon. Landslide hazard zone Investigation is compassed which can be used for landslide forecasting and forewarning. Prone areas are to be delineated by integrating multiple databases like topographical and rainfall data, ground slope and the geo-technical experiments to determine different soil parameters.

Key Words: Landslide, Idukki, Zone, Slope, Rainfall,

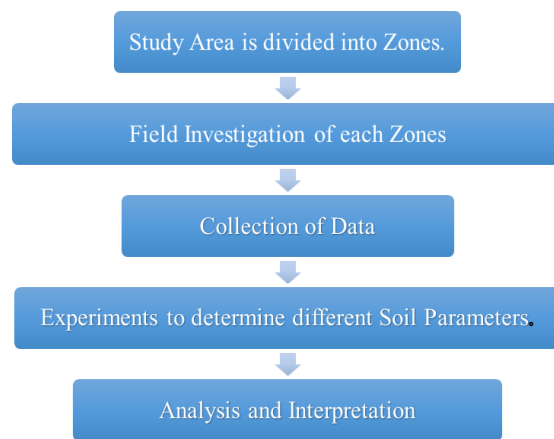
1. INTRODUCTION

A landslide, also known as a landslip, is a geological phenomenon that includes a wide range of ground movements, such as rock_falls, deep failure of slopes, and shallow debris flows. Landslides can occur in offshore, coastal and onshore environments. Although the action of gravity is the primary driving force for a landslide to occur, there are other contributing factors affecting the original slope_stability. Rainfall induced landslides are common in tropical and subtropical regions where residual soils exist in slopes and there are negative pore water pressures in the unsaturated zone above the water table.

Topography is a key factor for landslide susceptibility. In flat terrain, the gravitational forces are too weak to move land masses. With increasing inclination, the terrain becomes more susceptible to land sliding. Natural loose geological material is usually stable up to slope angles of 27°. In terrain steeper than 30°, rocks and other loose materials fall continuously and do not create deposits which can form larger landslides.

The goal of this project is to undertake a uniform and objective analysis of landslide hazard and risk regions in Idukki District, Kerala.

2. METHOD ADOPTED



3. AREA OF INVESTIGATION

1. ZONE 1 : MUNNAR
2. ZONE 2 : IDUKKI
3. ZONE 3 : THODUPUZZHA

4. INVESTIGATIONS DONE

1. Reconnaissance Survey
2. Opinion Survey
3. Slope Check
4. Collection of Soil samples.

5. Zone 1: Munnar

- Rainfall Data^[1]

Month	Avg. Rainfall (mm) at various rain gauge stations (2001-2011)
	Munnar
January	16.1
February	23.7
March	39.3
April	146.9
May	252.2
June	743.4
July	1098.2
August	702.8
September	341.7
October	263.1
November	136.3
December	39.6

- Slope

	Chiyappara	Munnar	Devikulam	Bison Valley	Kunjithanny
Avg. Slope (in degrees)	54	48	57	43	58

• Lab Test Results

EXPERIMENT	SITE				
	CHIYAPPARA	MUNNAR	DEVIKULAM	BISON VALLEY	KUNJITHANNY
WATER CONTENT	25.38%	24.56%	23.32%	26.1%	21.53%
SPECIFIC GRAVITY	2.41	2.56	2.63	2.48	2.6
DIRECT SHEAR	$\Phi = 18.01$ $C = 0.51$	$\Phi = 17.98$ $C = 0.47$	$\Phi = 19.32$ $C = 0.48$	$\Phi = 18.71$ $C = 0.52$	$\Phi = 18.9$ $C = 0.48$

6. Zone 2: Idukki

• Rainfall Data^[2]

Month	Avg. Rainfall (mm) at various rain gauge stations (2001-2011)
	IDUKKI
January	18.4
February	29.3
March	13.3
April	215.1
May	89.9
June	711.3
July	1025.1
August	478.8
September	616.7
October	369.5
November	120.0
December	142.9

• Slope

	Thadiyampadu	Cheruthoni	Churuli	Kuyilimala	Parremavu
Avg. Slope (in degrees)	52	57	49	61	55

• Lab Test Results

EXPERIMENT	SITE				
	THADIYA-MPADU	CHERUTHONI	CHURULI	KUYILIMALA	PARREM-AVU
WATER CONTENT	19.83%	17.45%	20.98%	21.01%	18.53%
SPECIFIC GRAVITY	2.48	2.54	2.50	2.54	2.46
DIRECT SHEAR	$\Phi = 19.86$ $C = 0.48$	$\Phi = 16.37$ $C = 0.52$	$\Phi = 17.04$ $C = 0.45$	$\Phi = 17.23$ $C = 0.47$	$\Phi = 18.73$ $C = 0.49$

7. Zone 3: Thodupuzha

• Rainfall Data^[3]

Month	Avg. Rainfall (mm) at various rain gauge stations (2001-2011)
	THODUPUZHA
January	23
February	43
March	64
April	170
May	360
June	705
July	779
August	587
September	342
October	368
November	208
December	64

• Slope

	Velliyamattom	Poochapra	Poomala	Malayinchi	Kanjar
Avg. Slope (in degrees)	54	48	57	43	58

• Lab Test Results

EXPERIMENT	SITE				
	VELLIYAMATTOM	POOCHAPRA	POOMALA	MALAYINCHI	KANJAR
WATER CONTENT	23.09%	21.68%	22.14%	19.71%	18.52%
SPECIFIC GRAVITY	2.47	2.51	2.49	2.53	2.57
DIRECT SHEAR	$\Phi = 17.83$ $C = 0.46$	$\Phi = 18.35$ $C = 0.51$	$\Phi = 17.91$ $C = 0.49$	$\Phi = 18.73$ $C = 0.46$	$\Phi = 18.74$ $C = 0.52$

8. CONCLUSIONS

After analysis and interpretation of the collected data, parts of Devikulam and Kunjithanny in Munnar Zone, Kuyilimala and Parremavu in Idukki Zone, Velliyamattom and Poomala in Thodupuzha Zone found to be more susceptible to landslides compared to other places in their respective Zones. Considering the rainfall receiving and slope of the terrain, Devikulam in Munnar and Kuyilimala in Idukki can be marked as the most landslide vulnerable areas in all the Zones.

REFERENCES

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