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Landslide And Risk Assessment In Uttarakhand With Special Reference To Malpa

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Abstract:

Landslides have a very old history in Uttarakhand. Landslides are the part of a more general erosional or surfacial process known as mass wasting which is simply the down slopemovement of earth or surface material due to gravity. The term landslide is not new to this region. Uttarakhand is one of the most landslide pron regions in the world. A Malpa landslide occurred on 18th August during 00:30 to 03:00 AM. This devastated landslide took lives of more than two hundred persons along with sixty Kailash Mansarovar pilgrims. The whole Malpa village lost its very existence due to this landslide tragedy. The sixty members of the Kailash Mansarovar pilgrims lost their lives.In the economic loss the camp and residences of KMVN, the material and the minimum permitted amount of 500 dollars for payment to Chinese agency of the pilgrims was destroyed in the debris. Around fifty mules costing Rs 10-12 thousand each were dead, which had been the only source of livelihood for their owners. They earn about Rs 200-250 per day during the pilgrimage only and utilize the earnings for the whole year. The local residents of that area, who lost their lives, were mostly young and the earning members of their family. That is well known that the natural disasters cannot be avoided but all possible attempts to mitigate its affects should be made timely. The lesson learnt from Malpa landslide stresses upon the utilization of these experiences in future to mitigate the landslides.

1.Introduction

Landslides have a very old history in Uttarakhand. Landslides are the part of a more general erosional or surfacial process known as mass wasting which is simply the down slopemovement of earth or surface material due to gravity. The term landslide is not new to this region. Uttarakhand is one of the most landslide pron regions in the world. According to geologists, the Central Himalayas came into existence after the Southern Peninsular moved northward. The Himalayan sand and stones were converted into the long mountain chain of the Himalayas due to the movement of Indian plate northwards and its collision with the Asian plate. Since then Himalayas are rising, resulting into several weakness in the terrain. According to geologists the Main Central Thrust(MCT) is a major tectonic feature in higher Uttarakhand Himalayas (considered to be Precambrian to Archaeanage over the younger sedimentary).

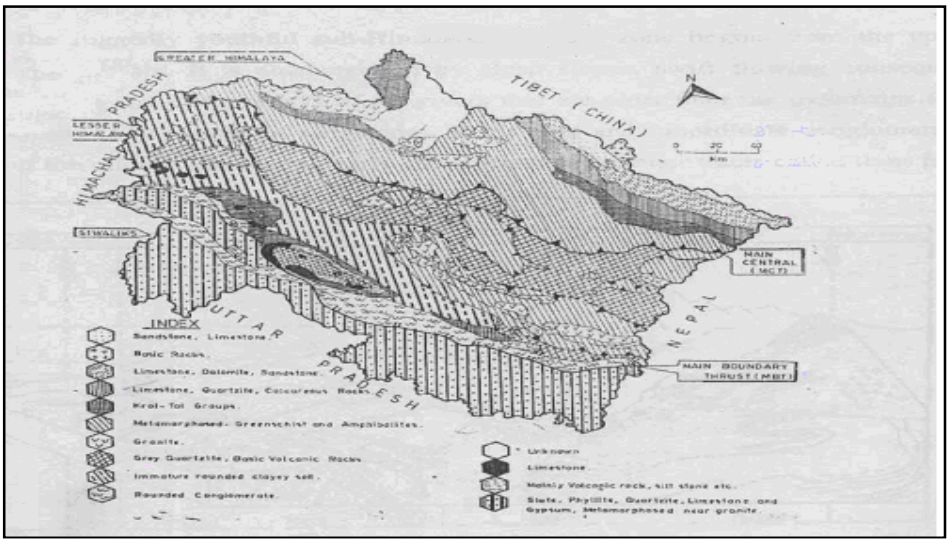

Figure 1 : Uttarakhand Geological Map
Source: Uttarakhand Paryavaran Manchitravali

2.Aims And Objectives Of The Work

The work is to provide aid to community and the government in improving the ability of the Disaster Management System.

- Intensifying the efficiency of the society.
- Special attention is given to tragedy in Malpa landslide.

	Landslide	Date
1	Landslide in Pauri region	26.05.1816
2	Joshimath road	05.03.1842
3	Rani Slide, Rishiganga	11.04.1843
4	Helong Slide	16.06.1902
5	Chamoli Slide	13.06.1906
6	Nandprayag Slide	11.12.1908
7	Mansuera Slide	27.07.1926
8	Thirpak Slide	08.10.1927
9	Gyansu Slide	05.03.1935
10	Kannodia Slide	15.03.1935
11	Slide at Rishikesh Gangotri roads	20.10.1937
12	Sis Slide	28.12.1958
13	Gandhinagar Slide	31.12.1958
14	Nainital Slide	13.07.1962
15	Ganai Subsidence	14.07.1962
16	Kaliasor Slide	27.11.1963
17	Patal Ganga Slide	29.04.1964
18	Dhaknala Slide	28.03.1965
19	Kornaprayag Slide	28.03.1965
20	Slide on Kalsi-Chakrota road	28.03.1965
21	Tangni Slide	13.05.1965
22	Birchi Slide	02.01.1967
23	Joshimath Area Slide	03.05.1968
24	Tharoli Subsidence	03.03.1959
25	Okhimath Slide	30.01.1971
26	Deoli Subsidence	17.08.1972
27	Tanakpur Chalthi-Ascot Road	10.02.1973
28	Didihat (Chuprakhet)	24.02.1974
29	Karmi	07.07.1974
30	Kapkot (Baghar Village)	1976
31	Bhagirathi Landslide	1978
32	Sirsa (Tawaght)	14.08.1977
33	Kontha Village in Mandakini Valley	1979
34	Uttarkashi (Gyansu Town)	23.06.1980
35	Uttarkashi (Kanodia Gad)	09.09.1980
36	Kaliyosour slide	1984
37	Kadar Valley of Uttarkashi	1991
38	Pinder Valley of Chamoli	1991 & 1992
39	Malpa Slide	17.08.1998
40	Okhimath Slide	11th, 12th August 1998 and 18th, 19th August, 1998

Table 1: Major Landslides in Uttarakhand Himalayas
Source – Himalaya Van-Panchayat Samachar

Figure 2: Hazard Zonation of Uttarakhand Land Slide

Source: Valdiya,K.S.

3.External factors of landslides

- Change of gradient
- Excess loading
- Change in vegetative cover
- Shocks and vibrations
- Internal factors of landslide
- Change in water content
- Effect of ground water
- Geography of Malpa

Malpa is a small village situated in latitude of 30°01’55” N and longitude $80^0$45’07”E and lies on the right bank of Kali river in the Kumaun Himalaya. The distance of Malpa fromDharchula town is about 43 km and 275 km from the rail head Tanakpur. Malpa is one of the International boundary of India with Tibet and Nepal. The dip of rocks is about 60°-70° on both sides and the valley is narrow. Malpa village is mostly covered by scanty grasses inscattered spots. The area is very rugged, relief is high, gorges are deep and narrow and the rivers have high discharge. The village had been established by tribal

people during 1956, basically this being enroute for trade with Tibet. Presently the route is being used mainly by pilgrims to visit Kailash Mansarovar.

4.Geology Of Malpa

The area is located between Vaikrita Thrust and Trans Himadri Fault inclining N.W-S.E. It falls in great Himalayan ranges, having rugged topography. The area contains pre-cambrian "Central Crystalline Zone". The area is seismically very active which falls in seismic zone V. The area around malpa is landslide prone. Malpa itself is located on debris of an old landslide.

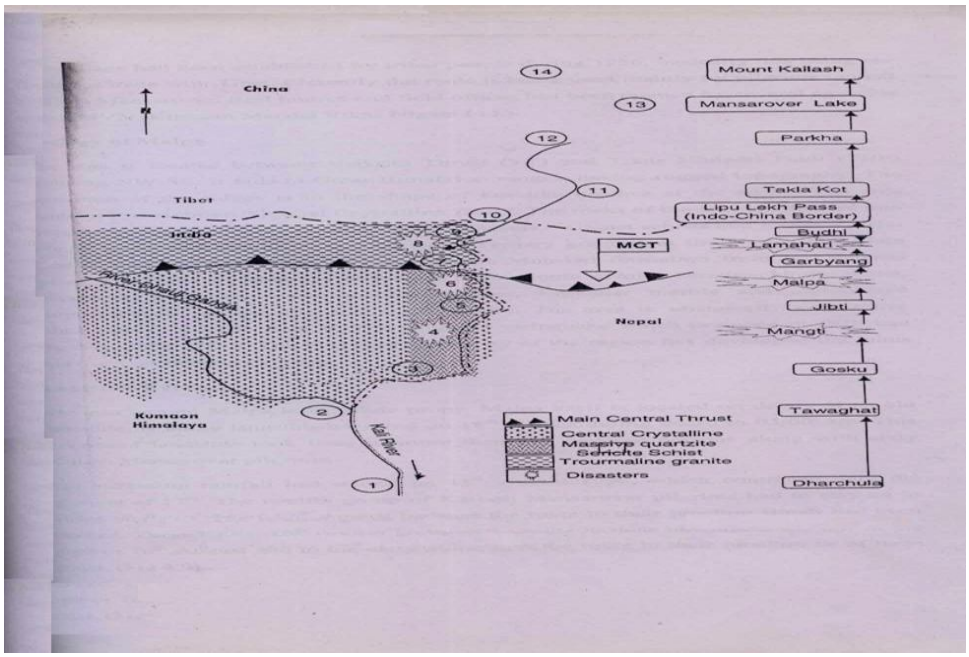

Figure 3: Geology of Malpa
Source : Uttarakhand Paryavaran Manchitravali

5.Malpa Landslide

A landslide occurred on 18th August during 00:30 to 03:00 AM. This devastated landslide took lives of more than two hundred persons along with sixty Kailash Mansarovar pilgrims. Increasing rainfall had started on 15th August, 1998, which continued until the morning of 17th Large boulders had fallen from the drain formed between the hill in the night of 16th August and in the early morning of 17th August with violent storm a major rock avalanche took place on 18th August continuous falling of boulders and rocks and their collision were emitting sparks according to individuals

present on the scene at that time. The rocks from the hill in which valley malpa was situated had started sliding violently over the populated area. The next rock avalanche occurred at about 03.00 hrs and continued for one hour which further contributed to the pile of debris. The rock fall continued on 19th, 20th and21st of August. As a result, Malpa valley was blocked and a 20 m long pond was created.

6.Damage Assessment

The total population of Malpa is about 30 to 40 persons only but during the period of Landslide, Kailash Mansarover Pilgrims also were staying there.

Sr. No.	Description	No. of Human Loss
1	Kailash Mansarover Pilgrims of 12th group	60
2	Guides and workers of KMVN	05
3	Collies of Kailash Pilgrims	59
4	Labour of GREF	09
5	Members of ITBP Force	08
6	PWD Labour	04
7	Members of 5 families of Malpa	16
8	Constbles of UP Police	03
9	Inhabitants of Gunji and Bundi present in Malpa at the time of the tragedy	32
10	Inhabitants of Dumling Village, Nepal	12
11	Hermit	01

Table 2: Description of Human Loss
Source : Himalaya Van Panchayat – Samachar (1st July – 30th Sept, 1999)

In addition to the human loss, there was loss of cattle,houses and fiber huts. The main track of the route was totally damaged.

7.Causes Of Malpa Landslide

The causes of Malpa landslide is the fracture and joints which wear weakened in Malpa area due to wedge failure. The slope failure is caused due to the presence of Main

Central Vaikrita Thurst and MCT in the South and Tethyan Shear Zone in the North. Heavy rains in the preceeding days for a week had created pore water pressure in the fractures, which caused the slide.

Land use Type	Area (Km^2)	Percentage under Landslide
Forest	0.66	15.28
Barren	3.48	80.81
Agriculture	0.17	3.90

Table 3: Correlation between landslide and land use in Kali Valley
Source : Rautela, Piyoosh et.al (1999)

Slope Category	Area (Km^2)	Percentage under Landslide
Flat ground (0^0 to 5^0)	0.20	4.67
Gentle-Slope (6^0 to 15^0)	1.80	42.03
Moderate-Slope (16^0 to 30^0)	1.42	33.21
Moderately High Slope (31^0 to 45^0)	0.52	12.19
High Slope (46^0 to 60^0)	0.23	5.42
Steep Slope (76^0)	0.11	2.49

Table 4: Correlation between slope and landlsides
Source Rautela Piyoosh et.al (1999)

Landslide Hazard Class	Types of Land	Area (Km^2)	Percentage
Very High	Forest	12.04	19.39
Very High	Barrenland	43.75	70.44
Very High	Agriculture	6.32	10.1
High	Forest	42.21	15.93
High	Barrenland	2.9	82.64
High	Agriculture	3.90	1.47
Moderate	Forest	18.33	2.29
Moderate	Barrenland	67.47	78.37
Moderate	Agriculture	0.29	0.34
Low	Forest	3.39	6.66
Low	Barrenland	25.84	51.10
Low	Agriculture	0.11	0.22
Very Low	Forest	0.84	0.12
Very Low	Barrenland	8.11	23.76

Table 5:Correlation between hazard classes and land use

Source – Rautela, Piyoosh et.al (1999)

Table 3,4 and 5 shows that most of the landslides occurs in barren land and so the area under gentle slope in Kali Valley has maximum percentage of landslides.

8.Conclusion

The whole Malpa village lost its very existence due to this landslide tragedy. The sixty members of the Kailash Mansarovar pilgrims lost their lives.

In the economic loss the camp and residences of KMVN, the material and the minimum permitted amount of 500 dollars for payment to Chinese agency of the pilgrims was destroyed in the debris. Around fifty mules costing Rs 10-12 thousand each were dead, which had been the only source of livelihood for their owners. They earn about Rs 200-250 per day during the pilgrimage only and utilize the earnings for the whole year. The local residents of that area, who lost their lives, were mostly young and the earning members of their family.That is well known that the natural disasters cannot be avoided but all possible attempts to mitigate its affects should be made timely. The lesson learnt from Malpa landslide stresses upon the utilization of these experiences in future to mitigate the landslides.

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