

Landslide: Types and its Impact in Uttarakhand

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Abstract— This paper illustrates that the study of Landslides and its types along with the impact of landslide in the state of Uttarakhand. The event of occurrence of landslides in the state of Uttarakhand is very common now a days. In this paper I have studied about the types and impact of landslide in the hilly area of Uttarakhand. The aim of this paper is to mention about the types of landslide so that people can know about it and can take necessary measurement at the time of occurrence of this disaster.

Key words: Debris flow, Earth flow, Debris Landslide.

I. INTRODUCTION

In landslide there is a downward movement of rock mass along sloping surface under the force of gravity. The movement may be slow or abrupt. Every year a number of landslides occur and cause extensive damage to life and property. The change in an stability of the slope is the main reason of occurrence of landslides because the stability changes from stable to unstable condition of the slope. Landslides are common in the Lower Himalayas. Landslide can occur due to deforestation because of increasing population, urbanization especially from tourism. Landslide occurs in the parts of Western Ghats usually. Landslide is also known as a landslip which is a geological phenomenon that includes a huge range of ground movements, such as rock falls, deep failure of slopes and shallow debris flows, that may occur in offshore, coastal and onshore environments. Landslides that occur undersea have the tendency to generate tsunamis.

A. Types Of Landslide:

1) Debris flow:

The material of the slope that becomes saturated with water have the ability to develop into a debris flow or mud flow. As a result the mixture of rocks and mud may affect the trees, buildings and vehicles by which the roads, bridges gets blocked thus creating flooding condition. Sometimes debris flow seems like a flash flood has occurred but it is entirely a different process. Muddy-debris flows created by the slope-related factors and shallow landslides which results in t blockage of water temporarily. The mixture of solid-liquid can reach densities of up to 2 tons/m³ and velocities of up to 14 m/s (Chiarle and Luino, 1998; Arattano, 2003). These processes can destructs the roads due to accumulation of deposits and sometimes due to the complete removal of the bridges and roads or railway crossings.

2) Earth Flow:

Earth flows is defined as downslope, viscous flows of saturated fine-grained materials which move at any speed i.e. the speed may be either slow or fast. Basically, they can move at speeds from 0.17 to 20 km/h (0.1 to 12.4 mph). These are like mudflows, overall they move slowly and flow of this landslide carries a solid material along with it and also is covered by it. Clay, fine sand and silt, fine-grained

materials are the materials that can vulnerable to earth flows. Since the velocity of the earth flow depends upon the content of water available in the flow, the velocity will be higher. These flows usually begin when the pressures of pores in a fine-grained mass increase till the water pores support the weight of the material so that the shear strength of the material get decreased. Therefore it creates a bulging lobe which advances with a very slow and rolling motion. The mass increases as these lobes spread out where as the margins get dry out, and by this the velocity of the flow decreases. This process can cause the flow to thicken.

3) Debris Landslide:

When a soil of rocks and debris get mixed with water or ice or both ice and water they started moving along a slope, though this movement is considered as chaotic movement and is known as debris landslide. The movement of debris landslide is slow but not too slow. This is usually a result of lower cohesion or higher content of water and commonly steeper slopes.

4) Sturzstrom:

A sturzstrom occurs very rarely and is a poorly understood type of landslide, typically with a long run-out. The run-out is often very large, these slides are unusually continuous that flows far over a low angle or flat or even slightly uphill terrain.

5) Shallow Landslide:

In shallow landslide the sliding surface is located within the soil mantle or weathered bedrock They generally include debris slides and flow, as well as failures of road cut-slopes. It occurs in an area of the slope that has high permeable soils. The bottom soils which is low permeable traps the water in the shallower whereas high permeable soils creates very high water pressure at the top portion of the soil Slopes become unstable and may slide because of the water content available in top soil and due to this they may slide over the low permeable bottom soils. A slope carries silt and sand as top soil and bedrocks as bottom one. The bedrocks may trap the rain water at the top soil of silt and sand during the extreme dangerous rainstorm. When water gets added with the topsoil then it becomes heavy and saturated, it can again start to slide over the bedrock and by this a shallow landslide may occur.

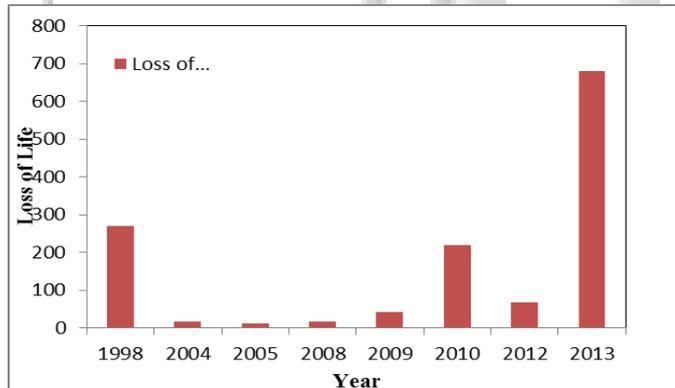
6) Deep Seated Landslide:

Landslides in which the surface of sliding is mostly located deeply i.e. typically to depths greater than ten meters below the root of the trees. These types of landslide basically involve deep destruction, weathered rock, and/or bedrock and also include large slope failure associated with translational, rotational or complex movement. The movement of this landslide is generally very slow i.e. several meters per year but sometimes the movement is very fast. This landslide is quite larger than shallow landslides and occurs along a plane of weakness such as a fault. One can identify it visually by concave scarps at the top and steep areas at the toe.

II. VULNERABILITY TO LANDSLIDES

Landslides are very common and frequent in the rainy season, this disaster is very dangerous as it takes a considerable toll of human lives, damages the roads, agricultural land and also damages the infrastructure such as buildings, houses, hotels etc. The state is affected because of transportation problem. The frequency of occurrence of landslide has increased in the recent past year due to the construction of roads and other haphazard developmental activities. In 2010, the State faced many natural disasters such as landslides, flash floods and floods during the period of monsoon. Due to landslide, at many places roads were got damaged and the connectivity of one road to other was also disrupted and tourists as well as pilgrims were trapped at various locations across the state. The impact of this disaster was so painful that the human death toll was 220 and massive efforts were made to restore normalcy. Again Uttarkashi and Rudraprayag districts were hit by flash floods, debris flow and landslides during the period of Monsoon in 2012 that took toll of almost 164 human lives. Thus, during the monsoon season, due to heavy rains, every year the state faces huge losses, from cloudburst, landslides and flash floods and other disaster. Besides road connectivity, water supply, communication, power and other infrastructure also get disrupted, many small and marginal farmers lost substantial portion of their productive agricultural lands and other valuable movable and immovable assets permanently in these events.

A. Impact Of Landslide:



This graph represents number of people died due to the Landslide with respect to the year in which the landslide has been occurred.

1) Preventive Measures Of Landslide:

- Improving surface and sub surface drainage.
- Constructing pipe and retaining wall.
- Rock – fall protection.
- Buttrussing the toe.

III. CONCLUSIONS

The disasters affect the life of people as well as the economy of the state. It is the responsibility of the state government to provide the state with various equipments so that the impact may be minimize in short duration as we all know the impact of disasters poorly affect the tourism and if the tourism of any state is affected then the source of income from these tourism is also affected. These disasters cannot be stop forcefully rather it is hard to predict about the

disasters. So one should study about how to minimize the impact so that the loss of life may be decreased. Loss of property is not a big matter but what matters here is loss of life because anyone's life can't be obtained again but the property can be obtained by people in the future. So one should focus on studying the measures of preventing the life of human as well as animals. One should provide the safety measures in disaster prone areas so as to balance the economy of the state because the hilly areas had always being a favorite spot for the tourists and these tourists help in maintaining the economy of the state.

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