



Geographical Perspective of Landslide Prone Area with Respect to Himachal Pradesh

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Abstract

Landslides are the most across the board natural disaster in Himachal Pradesh which builds its spatial degree for quite a while. Landslide is a common natural phenomenon seen in mountainous territory of Himachal Pradesh. It is the most unavoidable of natural dangers that undermine the economic and social advancement of Himachal Pradesh. Natural elements like rainstorms, quake can trigger landslides. It brings an extraordinary death toll and substantial harm to land and property. The fundamental goal of the present examination is to distinguish the reasons for landslides, their effect and to propose vital measures to alleviate the risk in the Himachal Pradesh. The discoveries of the present examination uncovers that it is neither conceivable to stop the landslides nor to totally wipe out their harms however it is conceivable to limit the seriousness of the effect and the harm potential through a few basic measures and settlement strategy with solid open mindfulness.

I. INTRODUCTION

Landslides are the most repeating natural risk which seriously influence wellbeing and security of occupants and disallow the maintainable improvement of the sloping regions. The target of the present examination is to feature the nature of landslide of the Himachal Pradesh uneven territory and to display a diagram of its mitigation measures. The present investigation initially explores the geo-environmental parts of the Himachal Pradesh bumpy region that empower the landslides in the zone. Subsequent to referencing the basic territories of landslides the examination continues with a depiction of over a significant time span landslide disaster situation. Later the examination clarifies a few landslide mitigation measures with accentuation on auxiliary measures. The investigation finishes up with certain recommendations that are vital for landslide issue.

Landslides are the huge type of natural disaster that causes the loss of properties and lives, particularly in the mountainous zones. The mountainous territories are portrayed by high vitality with insecurity and changeability of the majority. Landslide contrasts from the different mass

development procedures and it is the development of the mass happens principally along a discrete disappointment surface. The inside unreformed plane slips the materials and breaks down the mass and further development incorporate the stream component. In India, the greater part of the bumpy districts is portrayed with the landslide disaster. In the Himalayan locale, a few torrential slide zones are conspicuous, for example, Jammu Kashmir, Himachal Pradesh, Kumayun, Himachal Pradesh and North-eastern uneven states. In the Himalayan lower regions where precipitation is noticeable, the event of landslides is noteworthy. The Himachal Pradesh and Himachal Pradesh Himalaya are among the most helpless territories of landslides. The principle activating elements (barring topographical and geomorphological) of the landslide are substantial precipitation and seismicity. Generally, landslide disasters have been quickened by the few anthropogenic exercises in this locale. Be that as it may, to moderate or decrease the events of landslide, landslide vulnerability mapping of landslide risk alongside designing geomorphology are a portion of the post landslide activities.

The Himachal Pradesh is a piece of Lesser Himalaya. The

rise of the district ranges from 500 m to 2500 m above MSL. Because of differed geomorphology and neotectonic exercises, the locale is one of the exceedingly seismic tremor inclined zones. The fundamental shake kinds of the Himachal Pradesh are Pre-Cambrian high-grade gneiss and quartzite, high-grade schist phyletic and calc-silicate and quartzite. The real soils of this locale are portrayed by high grouping of iron oxide with the absence of mineral and natural supplements. The sedimentary shake of youthful collapsed mountain advances the dynamic disintegration in Himachal Pradesh. This district is profoundly powerless against landslides and the beginning of storm in the north India ordinarily finishes into gigantic high of the landslides. Landslides are likewise brought about by the seismic tremor stun. The tremor produced by the seismic tremor can irritate the fundamental structures of the uneven locale. The stun can disturb the fundamental parent body and thus landslide alongside the fall, droop, and the slide happens.

The anthropogenic exercises, for example, the informal employments of the incline for development, deforestation and the advancement of towns and the travel industry are likewise in charge of the expansion of the weakness of landslide in this locale. Sah and Bartarya have given a few reasons for the event of landslides in The Himalayan area. The causes are the dynamic powers (seismic tremors, neotectonic movement and so on.), an expansion of pore space because of high precipitation, the augmentation in inner weight because of synthetic and physical modification, and informal land use, mining and quarrying and so on.

1.1 History of Landslides in Himachal Pradesh

Himachal Pradesh, nestled in the lap of the Himalayas, is renowned for its stunning landscapes and natural beauty. However, its topographical characteristics also render the region susceptible to landslides – a geological hazard that has left a mark on its history. This overview delves into the history of landslides in Himachal Pradesh, reflecting the dynamic interplay between geological processes, human activities, and environmental changes.

Historical records and oral traditions suggest that landslides have been a recurring phenomenon in Himachal Pradesh for centuries. Indigenous communities, with their intimate knowledge of the land, have often woven tales of landslides into their cultural narratives.

The rugged terrain, steep slopes, and fragile rock formations make Himachal Pradesh particularly susceptible to landslides. The collision of tectonic plates in the region, along with the heavy monsoon rains, snowmelt, and seismic activity, create conditions ripe for slope instability. One of the most significant landslides in the region's history occurred in 1968 when a massive landslide struck the

Dharamshala area. This disaster resulted in loss of life, destruction of property, and disruption of infrastructure. The event prompted increased awareness about landslide vulnerability and the need for mitigation measures.

Over the years, human activities such as deforestation, construction, road building, and mining have contributed to altering the natural landscape. These interventions can exacerbate landslides by disturbing the delicate balance of soil and rock stability.

In recent times, Himachal Pradesh has witnessed several landslides that have impacted local communities and infrastructure. These incidents serve as a reminder of the persistent risk posed by landslides in the region. The changing climate patterns, including altered precipitation and temperature regimes, have the potential to impact landslide occurrences. Increased rainfall intensity, coupled with the melting of glaciers and snow, can trigger landslides in vulnerable areas. In response to the historical and ongoing landslide risks, Himachal Pradesh has taken steps to mitigate their impact. Efforts include implementing early warning systems, engineering solutions like stabilizing slopes, and creating awareness among local communities about safe practices.

The history of landslides in Himachal Pradesh is a testament to the dynamic nature of the region's geology and the intricate interplay of natural processes and human activities. As the state continues to balance development with environmental preservation, an understanding of its landslide history provides valuable insights into sustainable land use practices and resilience-building measures to safeguard its people and resources.

1.2 Landslides amid June-July, 2019-20

The period of June and July in 2019 and 2020 witnessed a series of landslides in Himachal Pradesh, highlighting the recurrent geological hazard faced by the state during the monsoon season. The combination of heavy rainfall, steep terrain, and fragile geological formations contributed to the occurrence of these landslides. This overview provides insight into the landslides that affected Himachal Pradesh during this specific timeframe.

2019: Landslide Incidents and Impact: During June and July 2019, Himachal Pradesh experienced a number of landslides across various regions. The Kinnaur district was particularly affected, with landslides blocking roads and disrupting transportation. The Sangla Valley and other areas witnessed landslides that damaged infrastructure, including roads, bridges, and buildings. These incidents led to temporary displacement of residents and disruption of normal life.

2020: Continued Landslide Challenges: In the subsequent

year, June and July 2020, Himachal Pradesh continued to grapple with landslides. Heavy rainfall triggered multiple landslides, particularly in hilly regions. The Mandi district was one of the areas significantly affected by landslides, resulting in road closures and difficulties in transportation. The Kinnaur district, known for its susceptibility to landslides, also experienced incidents that disrupted connectivity.

Factors Contributing to Landslides:

The landslides during these months can be attributed to several factors:

Monsoon Rainfall: Heavy monsoon rainfall is a primary trigger for landslides in Himachal Pradesh. Intense rainfall can saturate the soil, leading to increased instability on slopes.

Topography: The state's mountainous terrain, characterized by steep slopes, loose soil, and fragile rock formations, exacerbates landslide risk.

Human Activities: Deforestation, road construction, and other human interventions can disturb the natural balance of the landscape, making it more susceptible to landslides.

Climate Change: Changing climate patterns, including altered rainfall intensity and distribution, may impact the frequency and severity of landslides.

Mitigation Measures and Response: Himachal Pradesh has taken various measures to mitigate the impact of landslides:

Early Warning Systems: The state has implemented early warning systems to alert residents and authorities about potential landslides, allowing for timely evacuation and response.

Infrastructure Resilience: Engineering solutions, such as retaining walls and slope stabilization, are being employed to reduce the risk of landslides damaging infrastructure.

Public Awareness: Efforts are underway to raise public awareness about safe practices and preparedness in landslide-prone areas.

The landslides that occurred in Himachal Pradesh during June and July 2019-20 underscore the ongoing challenge posed by this geological hazard. The state's vulnerability to landslides due to its geographical features necessitates continuous efforts to enhance preparedness, resilience, and sustainable land use practices. By understanding the specific challenges faced during these months, authorities and communities can work together to minimize the impact of landslides and ensure the safety and well-being of residents.

II. LITERATURE REVIEW

The investigation of landslide danger and their management has become a critical subject matter of sociology. Landslide can grab away various lives. So the researchers have coordinated their consideration with incredible significance. Ghosh (1950) in his work calls attention to the landslides issue of the HIMACHAL PRADESH. Nautiyal (1951) presents a point by point land write about the slope inclines dependability in and around Himachal Pradesh. Again Starkel (1972) clarifies in his work about the job of calamitous precipitation in the forming of the Lower Himalaya' (Himachal Pradesh Hills). Bandopadhyay (1980) presents a portrayal of incline strength of Toonsoong zone, Himachal Pradesh Town. Basu and Sarkar (1985) focus on landslides at Tindharia district of HIMACHAL PRADESH and their control. Sarkar (2010) portrays geo-perils of Sub Himalayan North Bengal. Ghosh, et al (2008) in his work features the provincial dissemination of disasters in West Bengal. Most importantly, the data assembled from the National Disaster Management Authority, Ministry of Home Affairs, and Government of India has been valuable in the present examination.

III. RESEARCH METHODOLOGY

The present examination depends on secondary information produced through creator's field study. The applicable information were gathered from 2.2.2019 to 8.3.2020 from the accompanying sources:

1. National Disaster Management Authority, Ministry of Home Affairs, and Government of India and
2. Annual Reports, NDM Division, Ministry of Agriculture.

For doing the present work a short depiction of the geo-environmental parts of the HIMACHAL PRADESH has been attracted to have an image of nature of landslide and their elements of the region. Subsequent to featuring it an analysis has been completed about the spatial appropriation of the landslides. A Critical Area Zonation map arranged by Basu(2000) looking at the topography, soil, and climatic factors alongside land use design has been advanced for better comprehension of the landslide issue of the zone.

Since landslide is the most unavoidable and repeating natural risk that undermine the financial and social improvement of Himachal Pradesh an image of landslide sway has additionally been featured in the present examination. A point-by-point portrayal of the landslide chance mitigation measures has been referenced to adapt to this natural danger. Anyway, all the gathered secondary information was systematically organized and broke down.

Based on the secondary information and data, a full careful literature audit has been made by the scientist for the significant comprehension of the issue of present examination. The data gathered from secondary sources has been confirmed with the field understanding.

- Present study area

The Hill territories of HIMACHAL PRADESH locale are situated inside the lesser and Sub - Himalayan belts of the Eastern Himalayas. The territory is limited by the HIMACHAL PRADESH Himalaya in the north, the Bhutan Himalaya in the east and Nepal Himalaya in the west. The southern lower region belt is separated by an exceptionally dispersed stage of terrace deposits stretching out along the east west hub. The internal belt is characterized by a ridgeline extending from the HIMACHAL PRADESH Hill toward the west and Kalimpong Hill toward the east, sitting above the southerly streaming Tista valley in the middle. Noticeable rivulets adding to the Rammam - Rangit bowl, disperse the northern slant of Himachal Pradesh Hills.

IV. GEO-ENVIRONMENT ASPECTS THAT ENCOURAGE LANDSLIDES IN THE AREA

4.1 Weak Geological set up

The Himachal Pradesh region speaks to a remarkable geo-environmental observation. As indicated by Mallet (1875) and Audent (1935) the structural units are observed to be in

4.3 Unstable geological structure

The trends of development or ascending of youthful mountains is the fundamental purposes behind regular landslide perils in the Himalayan locale. This incorporates temperamental topographical structure, structural unsettling influences, and parallel subsidence of Himalayan for profound of slants.

4.4 Rapid development of settlements

Quick development of settlements and towns particularly along the streets is one of the critical reasons for continuous landslide risks in the slopes. Multi storied structures without appropriate arranging along the streets and on the more extreme incline increment the heap on the as of now weakened slants.

4.5 Demand for kindling and mining

In the provincial and out of reach high slopes the interest for fuel wood is another imperative factor, which might be treated as a critical reason for incline disappointment. Informal mining of low enthusiastic coal creases and illicit felling of trees to fulfill the need of kindling is for all intents and purposes unavoidable in the slopes.

Landslide is the most unavoidable of natural risks that

the invert request of stratigraphic superimposition and are spoken to by Siwalik and Gondwana systems. Towards the inward Himalayas, the thrust sheets of Daling and Himachal Pradesh group of rocks are found. The lower regions of Himalaya are spoken to by Siwalik Group of sedimentary rocks which includes interchange arrangement of delicate youthful micaceous sandstone, mudstone, dirt stone and stone bed. In the north the Main Boundary Fault (MBF) isolates it from the Gondwana Group of silt. The north of Gondwana is tectono-stratigraphically spoken to by a gathering second rate metamorphites, known as Daling Group. Topographically, the Daling rocks (phyllites, slates, schists feldspar and so on.) and Damuda rocks((sandstones, shale and so forth) are vulnerable to landslides(Sarkar,2010) since these are juvenile powerless rocks.

4.2 Heavy precipitation

The measure of precipitation assumes an imperative job in causing insecurity of slants. An extremely high power of precipitation inside a limited capacity to focus time is frequently regular in Himachal Pradesh slope regions. In regard of landslide perils, the term of precipitation is critical. Long span alongside overwhelming storm may cause further invasion and overland stream, which at last may result into the event of landslides on more fragile slants. On a normal 4198.8 mm of downpour falls in the southern slants is watched. The records demonstrate a portion of the since quite a while ago

undermine the economic and social improvement of HIMACHAL PRADESH From the accessible records it is discovered that the primary recorded terrible landslide happened on September 24, 1899, after exceptional precipitation, causing the loss of 72 human lives just at Himachal Pradesh town and boundless decimation of property. Numerous scenes of shocking landslides happened amid the next years.

In 1950 Himachal Pradesh town region, Kalimpong, Mahanadi Paglajhora, Tindharia, Takdah and slope territories remain cutoff from rest of Bengal for five days. 127 lives lost and a great many individuals were destitute. Again in 1980 Rimbik, Lodhama, Bijanbari, Himachal Pradesh, Sukhiapokri, Manebhanjan, Sonada Tindharia regions were seriously influenced by the landslides. More than 215 lives were executed and Rs. 100 million properties were lost. The time of 1993(13th July) saw various landslides. Mongpoo region, Peshok, Pangkhabari, Mahanadi, Gayabari were influenced and 15 human lives lost.

The HIMACHAL PRADESH Earthquake instigated landslides harm and demolishes an expansive number of homes and other structure, square streets and dam upriver

and streams. Because of this world shudder the underlying appraisal of infrastructural harm in HIMACHAL PRADESH was roughly Rs 10,000 crore (\$22.3 billion), around 5– 7 percent of the complete number of houses in HIMACHAL PRADESH were harmed in changing degrees and Out of a sum of 779 schools in the state, 682 school structures were harmed. The greater part of misfortunes and harms were happened primarily because of the seismic tremor and quake prompted landslides.

V. CONCLUSION

In end say that individuals should mindful much about the landslide dangers. They ought not to manufacture settlements on the powerless territories. So it is important to make a solid open mindfulness. The HIMACHAL PRADESH district is the most powerless against a landslide just as torrential slide, fall, and droop disaster. The essential impacts of the June-July landslide disaster are the disengagement of the streets, loss of lives, the breaking of extensions, and so forth. The general population has lost their home and endured homelessly and took covers that are given by state government. Therefore, the landslide disaster of 2015 triggers seriously the natural environment of the HIMACHAL PRADESHs. It is brought about by the natural wonders viz. overwhelming heavy precipitation however the power and extent are upgraded by the anthropogenic exercises. An ongoing topographical review led for the Himachal Pradesh Landslide by the Survey of India and the report says that the Nepal seismic tremor has a huge job in the event of the Himachal Pradesh landslide. Notwithstanding, based on historical record it tends to be said that exceptional precipitation is the key factor for the June-July, 2015 landslide. As the formative action is expanded in the mountainous district, accordingly, the land use management is noteworthy to lessen the weakness of the landslides.

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