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GEOGRAPHICAL DIMENSIONS OF THE DEVELOPMENT IN CENTRAL HIMALAYAS: A CASE STUDY OF CHAMOLI

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Geographical Dimensions of the Development in Central Himalayas: A Case Study of Chamoli

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Abstract – The Chamoli district and other areas of Uttarakhand continues in a very short time to face many disasters, such as landslides and flash floods. Strong rainfall and low shear strength from the rocks made these slides possible. In addition, floods, loose sediments, slopes and river banks were excavated. The main factor triggering and affecting growth are tectonic activities. Many participating in these activities continue to look for their essential needs to survive and restore their lives. Other factors influencing the growth of the region are climate warming and the river systems. Dynamics of the natural vegetation depend on the presence because of the sunlight. The altitude and the pitch are significant obstacles to the exploitation of resources and human operation. These are hurdles to all types of Chamoli district growth, such as roads etc. Different opportunities for sustainable management of water resources with problems for sustainable living of local communities have been discussed for the Garhwal region of the central Himalayan based on a detailed study of traditional ecological information connected with biodiversity, environmental and civilized management. The inference is that if local peoples' development needs are ignored for a long time, they will take action that is counterproductive to the conservation target. The complicated process of ensuring people 's engagement in environmental protection along with the social and economic growth of local communities, by capitalizing on the negative dimension of presenting information and eliminating its negative aspects through traditional scientific inputs.

Keywords: Chamoli, Tectonic Activities, Climate Change, Development, Central Himalayas, Slope Gradient, Drainage System.

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INTRODUCATION

In the Central Himalayan area, Chamoli, which was established as a separate regulatory district in 1960 from the former district of Garhwal, is part of the popular 'Kedar Kshetra.' District Chamoli is situated in the north-west of Uttarkashi, south-west of Pithoragarh, south-east of Almora, south-west of Rudraprayag and west of Tehri Garhwal. The geographical area of the District is around 7520 sq.kms (Bahuguna IM, 2007).

The Himalayas are the young mountains in the world because of their geology. The land mass now protected by them was occupied by the large geosynclinals of Tethys sea during an early phase of Mesozoic or secondary geological history. The likely start date of the Himalayas is the end of the Mesozoic period, but it has not yet begun to unravel the history of their formation. No dotation of rocks is still possible in many instances, although the rocks and sediments linked to peninsular India are old and new, intrude and crystalline (VK, 2009). The region in the district is profoundly interspersed with the headwaters of the Allaknanda River, which appears to have formed later than its tributaries. However, it is well recognized that rapid change has occurred. There are portions of the upsurge since the middle of Pleistocene, some parts of the strong yet subdued topography and the deeper slopes elsewhere. The piling direction is typically from north to south in these mountainous masses. The region's geological character forms a two large divide between the villages Hilang in Joshimath and Loharkhet in the neighboring district of Pithoragarh. The north and the south are an artificial distinction between the east and south (JC, 2002). The division of North, which mainly consists of medium to high-quality metamorphic stones with higher ranges and snow-covered peaks, is intricate with later volcanic rocks. The South Division comprises of sedimentary and low-degree metamorphous rocks, which are also intruded by later volcanic rocks and is controlled by lower altitudes. The first division of boulders such as quartzite, marble and several forms of micaceous shifts and gneisses is not studied geologically very much, but has some occasional occurrence of explosives, graphite's, iron, cyanides and mica and vein quartz. In the south of the arbitrary line the division into rocks such as gneiss, claystone,

phyllites, quartzite's, sericite-biotite schist and slates is more well-known geologically (SI, 2002).

TECTONIC ACTIVITIES:

In plate boundaries, where edges of two (or more) plates have contact along vast lineal zones of fault, tectonic activity (earthquakes, volcano, and mountain ranges in general) is prevalent. Tectonic plates are the analysis and interaction of these crustacean slabs (Prasanna K. Samal, 2009).

The growth of Chamoli District has a big effect on these activities. Earthquakes, volcanoes and mountains have an impact not only on growth but also on life. The creation is never in good mode when people are distracted.

Earthquakes and vulnerability*:* Earthquake is one of the biggest obstacles in the region's growth. It affects the lives of people and their property. Several people died as the buildings fell down and contact was disrupted. Although local people were trapped in these salient problems, progress was not able to move comfortably.

The researcher said that several hundred people have been injured and some 50,000 houses were destroyed during the 1999 earthquake. The earthquake affected about 2000 villages. The earthquake in particular in Chamoli also seriously affected power, water supply and connectivity (Cruz RV, 2007).

There are several highways and footbridges over the rivers, rivulets and gorges in the town. The road bridges are built of a variety of different materials, including steel, reinforced glass and reinforcement maçons, as well as different designs and shapes (trusses and t-beams). No damage was found to any of the road bridges. The majority of the roads were suspended, and no specific damage was found to the structural system or support pylons. Cracks were found on roads, mainly because of the movement of land caused by weak pastes.

Volcanoes: Volcanic activity in district Chamoli alone have been common in the past 31 years with the number of volcanic eruptions. Even at long distances from the volcano, these eruptions can have serious social and economic effects. Fortunately, many eruptions are accompanied by disturbances, which can be observed with soil, air and space tools. Data from these methods coupled with fundamental knowledge of how volcanoes function from the foundation for predicted eruptions where, when and how the implications work (Bapalu, 2005).

Precise estimates of the probability and scale of an eruption within a given period are based on scientific knowledge of the procedures for holding, climbing and erupting magma. However, the small number of volcanoes and eruption forms found in digital tool make our knowledge of volcanic systems incomplete. The researcher describes main scientific issues, goals for strategic step and methods for developing a volcanic scientific culture that can be without them.

Loss of forests and mountains: The analysis of forest fragmentation shows that a large central forest has collapsed over the study period. In the period 1976-2014, the total area of forest areas, totally degraded and mountain areas at the same time, have increased. The result suggested that the reduction of forest covers and the erosion of mountains were mostly motivated by anthropogenic sources but also by natural factors. An rise in scrubbing and steep mountain land has also led to wasteland or non-forest land build-up in this area. To create a rational land use pole, development plains need to evaluate the trend and level of land cover transformation.

SLOPE MORPHOMETRY

Slope plays a vital role of rocky slopes, vertical scarves, deep regolith covers and mass waste scree cliffs in deciding the strength of mountainous terrain, because of denotationary processes in Chamoli district. Slope structure can affect groundwater vulnerability in various ways. The pitch-shape influences the river or sub-pit drainage direction and sum to an area (S., 2009).One possible mechanism responsible for the initiation of landslides is the concentration of sub-surface drainage within the concurrent road, resulting in higher pore water pressure in the axial areas than on flanks (Pierson, 1980). However, steeper terrain ranging from 40 ° to 60 ° is less prone to failure than ground ranging from 30 ° to 40 °. This is because the slope creating the material of this pathway terrain is not overlaid by colluvium and colluvial deposits that are most vulnerable to precipitation caused failures cover the slightly hilly inclines (Pearce, 2003).The pitch map describes pitch groups based on the frequency of treatment of different pitch angles. The area slope map is divided into six classes for the purposes of the current analysis those are given as, 0-10°, 10°-20°, 20°-30°, 30°-40°, 40°-50°, 50°-90°. Large portion of the study area (26 percent) is observed to be fall in 50°-90° (very steep slopes) while 22 and 20 percent respectively fall under 40°-50° (steep slopes) and each 30°-40° and 20°-30° (moderately steep slopes). 10°-20° (gentle slopes) and 0-10° (very gentle slopes) in the study area account for 9 and 3 percent of the area, respectively (Klinke, 2002).

Rock falls/ Slides: Landslides are among the most destructive and frequent catastrophes in the region of Chamoli and affected a number of mountain areas. The most landslides in the Chamoli district Himalayan area are caused by rainfall as can be seen in the global landslide dataset. In the Indian Himalayas, 580 landslides with 477 caused by rainfall happened during the same period, representing 14.52% of the worldwide landslides. According to (Ford, 2004) 221 people, including 60 Mansarovar kailash, were dead in the Kali valley of the Kumaon division of Uttarakhand

on 17 August 1998, after heavy rain and cloud burn in the Malpa region.

The growth of the district is very badly affected by this form of rock with disturbances to the landslides, telecommunications. The level of tourism has fallen and the wealth rate has fallen. Lineament 1st level of buffer (0-500 m) and the east and south side of the Chamoli area have the most influence. With the rate of growth in district Chamoli, the rate of land sliding is the opposite. Ultimately, low development will be expected with the expensive elevation-sliding rate.

Rainfall: Most landslides are caused by precipitation in the sub-continent. Several efforts have been made in the Global Scenario to set rainfall thresholds on global, regional and local scales for landslides, both in terms of density-duration and preceding precipitation models. When the rainfall rises from the region's level, it has a very negative impact on the region's growth (Chakraborty, 2005). The rainfall levels for the events of the landslides are not yet well known in relation with the Indian Himalayas. No such thresholds for landslides have been identified in the Himalayan region at either a regional or a local level.

Glaciers: The precipitation in the Subcontinent triggers the bulk of landslides. The Global Scenario has been working in a variety of ways, both in terms of intensity and precipitation models, of evaluating precipitation thresholds on the national , regional and local scales for landslides. As rainfall increases from the level of the region, it has a very bad effect on the development of the area. In relation to the Indian Himalayas, precipitation levels for landslides incidents are not yet well understood. No landslide thresholds were found at regional or local level in the Himalayan region (Takeuchi, 2009).

This water also disturbs residents in the districts of Chamoli very badly, particularly those in the district at sea level. Water flows down to the urban area from the mountains. In this field, flood conditions are maintained and formers' cultivations and lives are destructed. Therefore, the progress was eventually halted.

Flash floods: Flash floods are known as one of the biggest hazards. It typically occurs after the maximum energy of precipitation in some area or in a small basin with a geological environment such as relief, slope and a formal component, drainage rate, etc***.*** (Ali et al., 2017). Global climate change has caused greater precipitation and flash flood events, a grave danger to mountain people such as the people in the Chamoli district. This flood bothers and prevents the entire district 's growth (Plate, 2002).

5.2. Debris flows: Debris spreads over long distances to carry vast quantities of waste within a short period of time (Zimmermann and Haeberli 1992). Slopes, loose debris and wet environments are the typical environments for debris flow operations (Lewin and Warburton, 1994). In some of the previous cloud burst events in the area, it has been reported that debris clouds were the main cause of destruction. The proof of the same is Gadni, Musudiyar, Okhimath, Jhakhla-Lah, Bastari and Naulra. The Okhimath tragic incident of September 2012 is thus the first disaster since the establishment of the State in terms of the loss of human lives (69 people) (Borga, 1998). The heavy precipitation of Giriyagaon, Salami, Mangoli, Chunni, Premnagar, Brahmankholi and Jva Kinana villages around the villages of Okhimath was reportedly devastated in landslides and waste streams. This is also the principal factor which seriously affects the district 's development.

DRAINAGE SYSTEMS:

Drainage systems, also called river systems, reflect patterns in the specific drainage basin created by streams, rivers, and lakes. They are driven by the rocky or soft topography of the earth, and a certain area is dominated by the gradients of the earth. Geomorphology and hydrology also consider streams as vernal pools (Correia, 1998).

The large-scale urbanization of district Chamoli results into rapid growth of urban drainage systems and substantially increased the time of urban drainage piping in urban areas between 2000 and 2016. Separate drainage systems are required for all the new communities, and existing combined sewer systems are required to become separate in compliance with the related national Uttarakhand regulations released in 2013. Drainage systems are, however, having some problems or difficulties in Chamoli district. Firstly, economic viability because the cost of drainage is a major burden for towns, especially small towns dependent on utilities. Investments in drainage systems between 1981 and 2016 represented 7.7 percent of the country's fixed investment in urban services, the fourth most of 10. Just under roads and bridges, rail transportation networks and water sources (Dixit, 2003). The second issue is efficiency. Drainage pipes are repositioned in a number of years, and this affects the efficiency of wastewater pipes, according to testing studies. In rainwater networks that control soil production, the Chamoli floods are a serious concern. Uttarakhand is the industry, which looks much more like the other towns in India. The third problem is that fixed drainage systems are adaptable to various current scenarios mainly driven by expansion and climate change. As one of the main motivating factors, the efficiency of drainage systems continues to deteriorate as Chamoli's shape shifts. The traditional features of Chamoli shift include both the building area and its impermeable portion, which contribute to a greater level of flooding of Chamoli and higher water contaminants of Chamoli (De Haen, 2007). Other important characteristics like the distribution configuration and the roof area can be conceptualized with the latest developed tools for

sophisticated simulation and control of Chamoli water systems.

CLIMATE

Climate requires heights to a great degree. The winter season takes place between mid-Novembers to March. Monsoon currents will enter the valley, the precipitation of extreme in the monsoon becoming June to September, since much of the area lies on the southern slopes of the outer Himalayas (] Ibarrarán, 2009).

Climate change affects livelihoods and regional growth. In the case of the division of Chamoli, many characteristics have a very poor impact on the climate average over various periods. With these modifications and results, the completely evolutionary cycle shifts and has been prevented.

Rainfall: Most of the precipitation falls in the period June to September, when the southern hemisphere is 70% to 80% of the total precipitation, and the northern hemisphere is 55% to 65%. The potency of the plants is attributed to a low temperature, which results in reduced evaporation and forest or foliage. However, in areas where vegetation is low or / or steep slopes or soils have been denuded, productivity is neither consistent nor even favorable, so the water uptake potential is negligible. This huge rainfall has stuck people's lives and reverses their growth.

Higher the rate rainfall will inverse with the rate of development of the district Chamoli.

Rain gauging stations put up at seven locations by Meteorological department of Govt. of India, represent the settled land mass of Chamoli district.

Temperature: The details of temperature recorded at the meteorological observatories in the district show that the highest temperature was 340C and lowest 00C. January is the coldest month after which the temperature begin to rise until June or July. Temperature vary with elevation. During the winter, cold waves in the wake of western disturbances may cause temperature to fall appreciably. Snow accumulation in valleys is considerable.

Humidity: During the monsoon season, the relative humidity is high, usually over 70% in average. The driest period of the year is pre-monsoon season when moisture in the afternoon will decline to 35 percent. In winter months, moisture rises in some high concentrations in the afternoon.

Cloudiness: During the Monsoon months, clouds are heavily clouded and for brief periods when western storms pass through the area. The sky is open of medium clouds for the remainder of the year.

Winds: Because of the existence of the landscape, there is a strong local influence and when specific winds do not overpower these impacts, the flow is anabatic during daytime and the katabatic during the night. There is a propensity to diurnal reverse of winds.

RIVER SYSTEM

Several large rivers and tributaries traverse the district of Chamoli. Most of the water comes from the glaciers of Chamoli district. Those glaciers have melt and excess water flows into canals and then into the rivers during the high-temperature season. Since there's no clear water route like this (Alaknanda, spanning 229 km. Until it comes to Bhagirathi in the village of Devprayag and makes up the ganga), it's the main river that contributes to the officially recognized river so the water has to traverse steep paths to connect the dam. If water rises from the highest, point of the roads and disrupts the life and growth of the district of Chamoli.

At 3641 meters below Balakun hill, Alaknanda originates at 16 km. The two glaciers of Bhagirath Kharak and Satopanth are formed upstream from Badrinath. From the eastern paths to Chaukhamba (7140 m), the Badrinath Mountain and its satellite ranges, rises the two glaciers. The Gangotri group of glaciers in the west separates these ranges (Tiwari, 2006).

In Chamoli district, the main part of the Alaknanda basin is filled. The valley is considered a high valley of Alaknanda from its origin to Hallang (58 km). The remainder of the region is known as the lower valley of Alanknanda. As the river leaves its source, it passes through a narrow deeper canyon along the Alkapuri mountain road, from which its name derives. It flows its river systems along its course.

The Chamoli River normally flows heavily through steep and narrow channels and sometimes contributes to extreme flooding and banks' failure. This high amount of deforestation ultimately results in soil degradation, harms plants' potential and reduces the survival. The banks of the canals break and shorten them, which then cause flood problems as the water volume in these canals is increased.

CONCLUSION

The rocks in the area are very delicate with these large tectonic divergences. The region is seismically active as well and lies in IV and V areas. In the past, Uttarkashi and Chamoli in 1999 suffered two major earthquakes. Such geomorphic characteristics, which include circus, sadder and funnel formed valleys as well as high relief and land use as a thick forest cover are considered provide the desirable conditions for the growth of oaks (banj) and rhododendrons (burans), and of the average altitude of 1.400 meters. In the Higher Himalayan Region, cloud bursting never happens, although in the Lower Himalayan region it is always the same. This is the key lesson of the Chamoli district 's growth in daily days. The rainfall in the

Himalayan mountain range is substantially different in amount, due to unpolluting topography, over a very short period. The ongoing projects are subject to minimal, sum of weather monitoring and weather randomness. While there is no excellently distributed network of hill meteorological observatories, many abnormally scattered precipitation occurrences are sometimes called cloudburst, especially in the media, particularly in the case of loss of human life and the associated destruction. The settlements are often built in overhead slopes, such as glacial sediments, colluvium and fluvial materials born in the accumulation of hill flows. Degradation of streams, along with rapid rate of erosion, increases siltation, destabilizes high slopes as debris, and slides in the fragile Himalayan area. In the same place, this involves instability and destruction. Given the repeated frequency of cloudbursts in the region, enhanced land use practice is widely recommended for future planning activities to minimize human and other risks and to make people in the area aware of them from time to time. If the risk likelihood is poor, work on the construction projects in Chamoli District of Uttarakhand will be easier.

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