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Unveiling the Catastrophe: Disasters in Himachal Pradesh with a Focus on Kullu District

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ABSTRACT

Global demographic shifts indicate an increasing concentration of population in regions susceptible to abrupt natural disasters. In the last 100 years the climate patterns have changed spatio-temporally over the Himalayan region resulting increase in the frequency of extreme weather events such as cloud burst, flash flooding, land slide etc. Such events have led to the loss of biodiversity, human lives and harm to the economy. The Beas basin of Kullu district of Himachal Pradesh has always been a potential hazard zone to such disasters. The recent monsoon season (July 2023) in Himachal Pradesh has also unfolded a tragic tale of unprecedented rains, resulting in catastrophic events such as flash floods, cloudbursts, landslides, and the subsequent loss of human lives and infrastructure. The Himachal Pradesh state is grappling with the aftermath, with numerous families displaced, essential public services disrupted, and a significant economic toll. Urgent attention and relief efforts are imperative to address the immediate needs of affected communities and kick-start the rehabilitation process. The objective of this paper is to assess the post disaster impact in Kullu valley on different sector like infrastructure, human life, biodiversity, etc and to analyse the mitigation measures taken by the government. As per methodology, the questionnaire survey has been carried out in disaster affected areas to know the people perception and also secondary data has been collected from various government line departments. As a result, the post disasters need assessment and the impact of disaster in different sectors has also been reported. The study will be helpful for understanding the impact of changing climate on Himalayan ecosystem and to prepare effective disaster risk reduction plan by the concern government agencies.

Introduction

The year 2023 brought significant challenges and natural calamities to the beautiful state of Himachal Pradesh in northern India. This article delves into the specific disasters that befell the picturesque Kullu district in Himachal Pradesh, highlighting the impact on its people, infrastructure, and environment. The district is characterized by its mountainous terrain, with the mighty Himalayas forming a prominent part of the landscape. The Beas River flows through the district. Kullu touches Lahaul & Spiti on the north and east, on the south-east by Kinnaur, on the south by Shimla, on the south-west and west by Mandi and on the north-west by Kangra. The climate in Kullu is cold and dry and with cold in the winter and heavy to low snowfall in some areas. During the current monsoon period of 2023, the Himachal Pradesh state witnessed three different spells of very high precipitation during 7-11 July 2023 (Ist spell), 11-14 August 2023 (IInd spell) and 21-23 August 2023 (IIIrd spell) causing widespread damage across the State. From July 7th to 11th, 2023, Himachal Pradesh experienced intense monsoon activity, resulting in widespread, heavy to extremely heavy rainfall across most of the state. Historically, during the monsoon season (June-September) from 1971-2020, the state averaged a rainfall of 734.4 mm. remarkably, in just four days, from July 7th to 11th, 2023, the state recorded 223 mm of rainfall, a staggering 436% above the typical amount of 41.6 mm for such a period. This surge in rainfall was unprecedented according to historical data. Every district in the state recorded excessive rainfall, with Kinnaur, Kullu, and Solan receiving the most. In particular, Kinnaur and Lahaul Spiti received 43% and 33%, respectively, of their average seasonal rainfall in these four days—a record high. The heavy rainfall caused significant

damage, including overflowing rivers, road obstructions, landslides, flash floods, bridge damage, and total disruptions to electricity and communication. Furthermore, there were tragic losses of life.

Objectives

- To assess the impact of disaster events in Kullu district, Himachal Pradesh.
- To analyse and suggest mitigation measures for minimizing adverse disaster impacts.
- To recommend institutional mechanisms and policy options to promote disaster resilience.

Materials and Methods

Study area

The Beas River rises in the Himalayas in Central Himachal Pradesh, India, and flows for some 470 kilometers to the Sutlej River in the Indian state of Punjab. Its drainage basin is 20,303 km^2 large. The river rises 4,361 meters above sea level (m asl) on the southern face of Rohtang Pass in Kullu district. Water basin of River Beas covers an area of 3274 km^2 in Kullu district and drains almost entire Kullu except extreme south. The highest point of the water basin is about 6536 meters and lowest point is 959 meters and the entire water basin have an asymmetric geometry. The basin is extended between latitudes 31º 43' 30" N to 32º 25' 0" N and longitudes between 76º 58' 26.4" E to 77º 51' 44.399" E. Realizing the impacts of assessment of various i.e. socio-economic, environmental, biological, infrastructural damage/loss caused by the Kullu Disaster 2023, current study will be carried out in the Beas Basin of Kullu district.

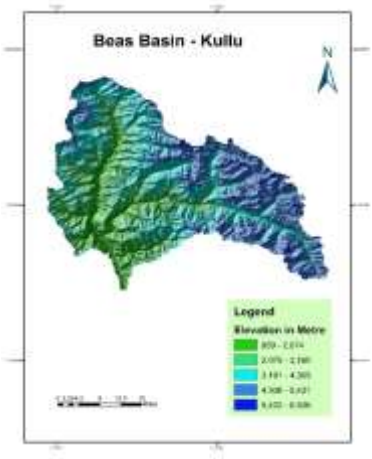

Fig.1: Beas Basin in Kullu District

As per methodology, the questionnaire survey has been carried out in disaster affected areas to know the people perception and also secondary data has been collected from various government line departments. Approach for carrying out the project is shown in a flow diagram:

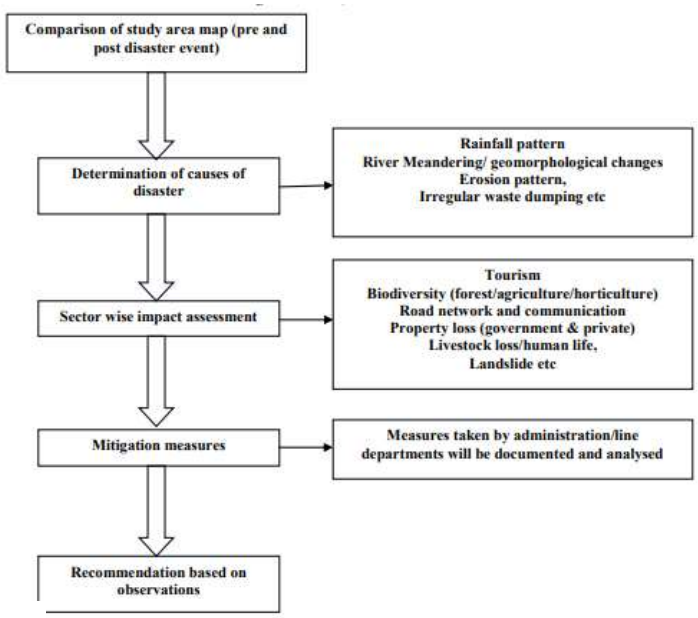

Fig.2: Flow Chart of Methodology

The Unpredictable Monsoon in Kullu District

Himachal Pradesh, with its diverse geography and elevations, experiences an annual monsoon season. However, in 2023, the monsoon arrived with unprecedented intensity. The excessive rainfall resulted in landslides, flash floods, and cloud bursts, wreaking havoc across the state. The rugged terrain made rescue and relief operations even more challenging.

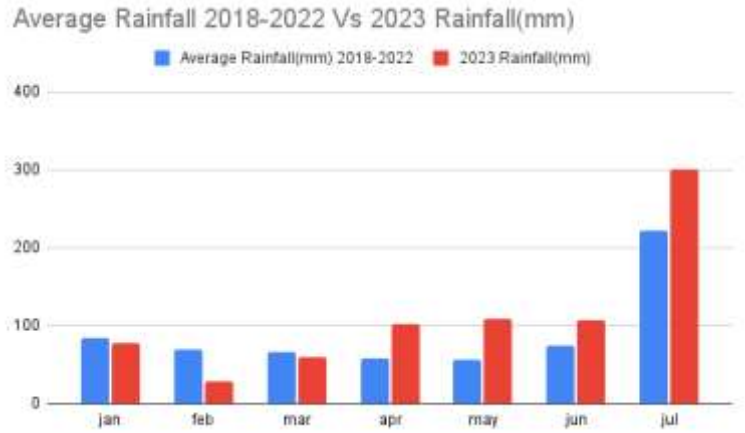

Fig.3: Average Rainfall Pattern in Kullu District (2018-2022 & 2023)

Analyzing the monthly rainfall data from Indian meteorological department for the years 2018-2022 and 2023, and considering the possibility of landslides and flooding in Himachal. As per our observations in the month of July 2023, April, May, and June exhibited substantially higher average rainfall compared to previous years. These months play a critical role as they precede July, which recorded the highest average rainfall for the year. The heightened rainfall during this period saturated the ground, creating potentially unstable conditions on slopes, consequently elevated the risk of landslides. As July arrived, there was a significant surge in average rainfall compared to the preceding years. The abundance of rainfall during July further saturated the soil, amplified the likelihood of landslides, particularly in regions already susceptible to such events. This year, in Kullu, the monsoon is unpredictable and ferocious, leading to excessive rainfall. The monsoonal onslaught, coupled with the region's topography, often results in flash floods and landslides. These events disrupt daily life, causing destruction and loss of lives.

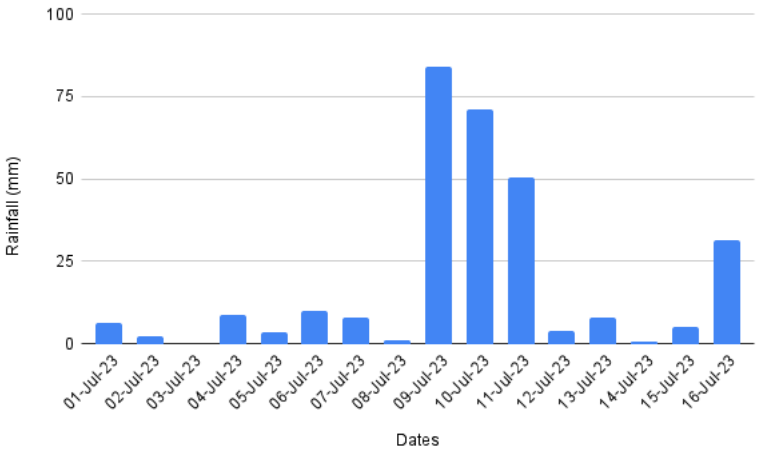

Fig.4: Average Rainfall Pattern in Kullu District (July, 2023)

On the 9th of July, the recorded rainfall was exceptionally high at 83.86 mm, indicating a substantial amount of rain in a single day. Such intense rainfall leads to flooding. On the 10th of July, the recorded rainfall was also significant at 70.92 mm. This is another day with an abnormally high amount of rainfall. The accumulation of water from the 9th, along with the additional heavy rainfall on the 10th, exacerbate flooding and its impacts on the area. The high levels of rainfall on the 9th and 10th of July caused flooding in the region during these two days.

Devastating Cloud Bursts and Floods in Kullu

Cloud bursts, a sudden and intense downpour over a small area, are a recurring disaster in Himachal Pradesh. In 2023, the state witnessed several cloud burst incidents, particularly in districts like Kullu and Mandi. These calamities led to the loss of lives,

destruction of infrastructure, and displacement of families. The impact was so severe that it left a lasting mark on the affected communities. In July 2023, the Kullu district in Himachal Pradesh, India, bore the brunt of nature's fury, experiencing a series of devastating events that left a trail of destruction and despair. On the 9th and 10th of July, the serene Sainj Valley was jolted by a sudden flash flood in the Sainj River. The catastrophe swiftly unfolded, washing away approximately 40 shops and 30 residential houses. Tragically, due to the region's inadequate communication infrastructure and limited road connectivity to Sainj from the main district headquarters in Kullu, the local administration remained uninformed about the incident in real-time. The flood had a profound impact, completely destroying Bekar village in Sainj, including about 15 houses and 200 bighas of vital agricultural land. The deluge severely disrupted essential services, such as communication, power supply, water access, and road connectivity across the Kullu district, further complicating the situation. In response to this crisis, a police team was dispatched to the Sainj area via helicopter, equipped with satellite phone facilities, to assess the losses and establish communication.

Fig.5: Cloud Burst and Flood in Kullu District (July, 2023)

The authorities are actively engaged in gathering detailed information regarding the extent of the damages and formulating appropriate relief measures. Simultaneously, the town of Manali, a popular tourist destination and heavily populated area, suffered significant destruction during the same period. The calamitous flooding wreaked havoc on the town, compounding the ongoing crisis. Similarly, Bhuntar faced extensive devastation, as the raging Parvati River flooded roads, houses, and multiple shops along its right bank, causing considerable damage to vital infrastructure, including bridges. These events marked the beginning of a trying period for the Kullu district, setting the stage for further natural calamities that would test the resilience and fortitude of its residents in the weeks to come. Moreover, on the 16th of July, a cloudburst in Lug Valley led to a flash flood in Sarvari Khad, devastating apple orchards, private land, houses, and cowsheds. On the 17th of July, a cloudburst in Kharahal valley led to a flood in Khrahal Nala, resulting in extensive destruction in Neoli and Juani villages. Tragically, a cloudburst in the Kais area on July 17th claimed the life of Badal Sharma from Chasri village and injured three others, causing substantial property damage. Lastly, a cloudburst in Jagatsukh on the 20th overflowed the local riverine, resulting in the destruction of agricultural fields and affecting the Kullu Manali road. Another cloudburst on the 25th of July in Garsa caused flooding in Panchanala and Hurla Nala in Gadsa valley. This calamity inflicted significant damage on the Bhuntar-Gadsa Maniyar road, destroying four bridges and damaging several houses.

Impact of Disaster on Infrastructure

The heavy rainfall and subsequent disasters severely impacted the state's infrastructure. Roads and bridges were damaged or swept away, disrupting transportation and cutting off remote areas. The landslides also blocked key highways, making it difficult for relief teams to reach affected regions. The loss of critical infrastructure hindered the speed of rescue and relief operations. Kullu is prone to natural disasters like floods and landslides. These calamities caused significant damage to the region's infrastructure. Floods in Kullu district were triggered by heavy monsoonal rains, which inundated the low-lying areas, damaged the roads, bridges, buildings, and

disrupted essential services. Landslides are a prevalent threat in the hilly terrain of Kullu. They blocked the road which leads to the transportation disruptions and isolation of certain areas like Sainj valley, Manali, Manikaran etc. During the process of constructing a four-lane road, hillsides were excavated, vegetation and trees were removed, and the earth's structure was altered. These alterations weakened the stability of the slopes, making them more susceptible to sliding during heavy rainfall and seismic activity. Moreover, the removal of vegetation deprived the soil of its natural binding roots, further increasing the likelihood of landslides. Transportation Networks are essential to economic activity. Damage to roads and bridges in Kullu interferes with the supply chains and caused shortages of goods and commodities.

Fig.6: Representative Photographs of Cloud Burst and Flood in Kullu District (July, 2023)

Loss of Lives

The disasters of 2023 had a profound humanitarian impact. Numerous lives were lost, and many families were displaced from their homes. The loss of livelihoods added to the distress of the affected population. The disaster response teams and local communities came together to provide relief, rescue, and support to the victims. Even after this, some incidents happened in Kullu.

- 1 woman lost her life in a landslide at Lankabekar village in Kullu district on 9th july 2023.
- Badal Sharma (28) s/o Ganesh Sharma, Village Chansari, Post Office Baripdhar died while Khem Chand (53) and Suresh Sharma (38) were injured in cloud burst that took place in Kais on 17th July
- On July 10, in the Dhaldi forest of Tosh village of Parvati valley, about 300 Sheep and Goats were buried alive due to flooding in the nullah.

Government Response and Relief Efforts

The government of Himachal Pradesh and the district administration Kullu carried out the relief work very well, along with them some organizations also involved in relief efforts for the flood-affected areas in Himachal Pradesh in July 2023. The focus was on ensuring the safety and well-being of the affected population. The following organizations have also provided support to the State Government and District administration:

1. Himachal Pradesh Tourism Development Corporation (HPTDC)
2. Satluj Jal Vidyut Nigam (SJVN)

3. H.P. State Cooperative Bank
4. AD Hydro Power Limited and Malana Power Project
5. Hindustan Unilever Ltd. (HUL)
6. NHPC Ltd.

Preparedness for Future Events

The disasters of 2023 emphasize the need for enhanced disaster preparedness and management strategies in Himachal Pradesh. Early warning systems, community awareness programs, and infrastructure resilience Land use planning and regulations, Vegetation and Erosion control, Slope stabilization, climate change adaptation must be prioritized to mitigate the impact of future calamities. Sustainable development practices and environmental conservation are vital components of long-term disaster risk reduction.

Conclusion

The year 2023 will be remembered as a year of nature's fury in Himachal Pradesh. The resilience and unity displayed by the people and authorities during these testing times demonstrate the strength and determination to rebuild and recover. It is a call to action for the government, communities, and environmentalists to work hand in hand for a more resilient and disaster-ready Himachal Pradesh.

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