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IMPACT OF KEDARNATH FLOOD TRAGEDY ON ECOLOGICAL AND SOCIO-ECONOMIC SETUP : A GEOGRAPHICAL STUDY

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ABSTRACT

The Himalayan region witnesses to devastating phenomena like floods, landslides, earthquakes, cloud bursts, and glacial lake outbursts. Uttarakhand, which is a part of the North-Western Himalayan region, got a horrific hydro-meteorological incident in June 2013. The outbreak of this disaster in the Hindu pilgrimage site was found to be of a huge amount. This catastrophic incident had a very terrible impact, thousands of people and animals succumbed to this devastating flood. Major cause for Kedarnath flood tragedy were recorded anthropogenic activities and unfavorable geographical conditions which were responsible for the flash flood, ecological damage, loss of living beings and socio-economic setup of human life in Kedarnath, Uttarakhand.

Keywords : Kedarnath Flood, Chorabari Lake, construction works, catastrophe.

Introduction

In simple words, a flood is a catastrophic incident in which the water of the rivers rises above the danger line. Its main reasons are extreme rainfall in a small time period, cloud burst and glacial lake outburst, etc. Many a time, these flood incidents become so horrible that there is the loss of many human lives, properties, infrastructure, and many ecological systems are affected by these flood disasters. Himalayan mountain range is the youngest fold mountain, which is made up of collision of two tectonic plates. A lot of floods, landslides, earthquakes, clod bursts, and glacial lake outburst calamities have been seen in the Himalayan region. Uttarakhand is an Indian state situated in the Himalayan Mountain which falls in the North-Western or Garhwal and Kumaon Himalayan region. Uttarakhand is famous as Dev Bhumi of Uttaranchal. There are four Dham (Holy places) of Hindus- Kedarnath, Badrinath, Gangotri, and Yamunotri situated in the Garhwal Himalayan region (Uttarakhand). Four Dham are the most important places for Hindus.

Kedarnath is one of the holy places of these four Dham and it is a great Indian pilgrimage site. The Chorabari glacier situated at some distance from the Kedarnath temple. From the snout of Chorabari glacier and companion glacier, Mandakini and its tributaries are originated. Chorabari Glacier is situated a few kilometers above the Kedarnath temple. In between the snout of the Chorabari glacier and above of the Kedarnath there is a lake known as Chorabari lake. The Kedarnath and other three pilgrimage sites of Uttarakhand, a large number of pilgrims come for pilgrimage every year. Mandakini is one of the major rivers of Kedarnath. Kedarnath is a small pilgrimage town situated at an elevation of 3,553 from the sea level. There was a horrible flood calamity in Kedarnath on 15 to 18 June 2013 and the water of the Mandakini and other rivers rose above the danger line. In this tragedy, the buildings, hotels, restaurants, roads surrounding the valley were devastated and many hydro-electrical projects and under construction were gone devastated. The catastrophic flood incident that took place in Kedarnath also had a bad impact on locals and

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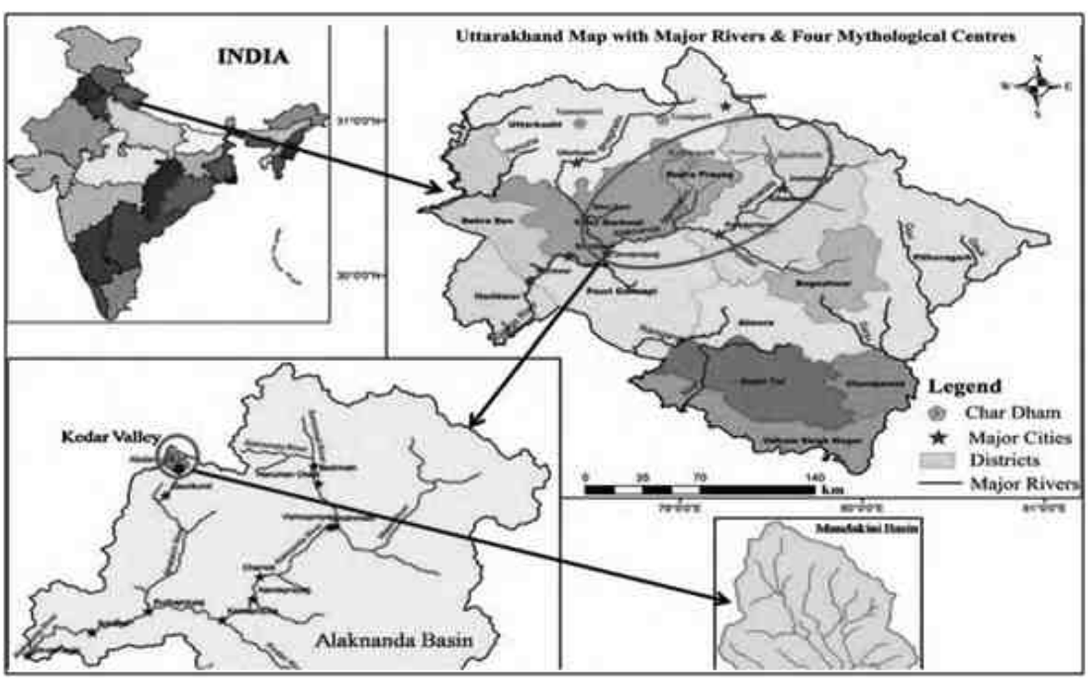
other parts of Uttarakhand. That three-day lasting flood tragedy was terrible the consequence was also very dire. A lot of pilgrims lost their lives and local people also but, in the end, relief was brought to the people by military rescue. 2013 Kedarnath hydro-meteorological incident, Rambara hamlet and many roads were destroyed falling between Gaurikund and Kedarnath temple.

The topographic and orographic conditions here were the main cause of this natural calamity. Somewhat even Human is liable for the loss they had to suffer in Kedarnath in 2013 as here constructive work plan off manner. The pilgrims coming in the numbers of millions per year also affect the ecological system of Uttarakhand. This paper is related to the 2013 Flood incident in this region when millions of pilgrims and tourists had come here for their pilgrimage and tourist purpose. The topography and geology of the area are oversensitive and fragile in nature which leads to such kinds of catastrophic incidents in the region. Human construction work and human interventions were equally responsible for the 2013; flood incident in this region, and its impact was very horrific because of its pitfalls. The major objective of the research area: 1) to examine the condition and factors responsible for the Kedarnath flood tragedy of 2013; 2) to examine the impact of the disaster on the people and the region; 3) to know about immediate actions had taken by armed forces during the flood to tackle the situation; and 4) to know whether the circumstances of such a disaster could again be created in the future.

Study Area

Kedarnath is situated in the Garhwal Himalayan belt and the Indian state of Uttarakhand. It is a holy Hindu pilgrimage site or town which is located in the Rudraprayag district of Uttarakhand. 11th jyotirlinga out of twelve jyotirlingas is situated in the Kedarnath shrine. Kedarnath is one of the four Dham of the Hindu and also a very sacred place for the Hindus. The Kedarnath situated in the most seismically active and landslide-prone Himalayan mountain range. This region is situated at an elevation of 3,553 meters above sea level and originated point of Mandakini river and Mandakini valley also located near the Kedarnath town. It is famous for the ancient Shiva temple. Due to extreme weather conditions, Kedarnath temple would open only from April to November. Several pilgrims come here every year for pilgrimage and tourist purposes.

Locational Map of Kedarnath (Uttarakhand)



Source: Kansal et. al, 2014, Probable Role of Anthropogenic Activities in 2013 Flood Disaster in Uttarakhand, India)

The road from Gaurikund to Kedarnath is 14 KM and between these a place called Rambara which totally destroyed in the 2013 flood disaster. The pilgrims travel on ponies, on foot, and by helicopter to reach Kedarnath from Gaurikund. Chorabari and other companion glaciers situated a few meters away from Kedarnath town. In 2013, a flood catastrophic incident in this region is adversely impacted the whole Kedarnath region.

Research Methodology

In this research paper, we use qualitative methods to collect the data and analyze the data. We use a secondary type of data sources to collect the data. The data have been collected by using the online survey, research articles, reports, notes, seeing documentaries, and news articles.

Kedarnath Flood 2013

In June 2013 a highly devastating incident occurred in the Garhwal Himalayan region of the Himalayan belt. On June 16 and 17, 2013 Kedarnath (Uttarakhand) was triggered by a vast flood due to the two weeks advancement of the South-West monsoon in north India. Entire Uttarakhand was affected by this flood. Bhageshwar, Pithoragarh, Rudraprayag, Chamoli, and Uttarkashi all the 5 districts were terribly affected by this havoc (Sharma et al., 2014). Indian Meteorological department stated that at this time South-west monsoon wandered from its way because of the low-pressure zone generated above the North Indian region. Generally, the monsoon is moved towards North-East India and then North India, but in 2013 it was deviated from its path before taking moisture from the Bay of Bengal and this time Westerly were also active in this region. Both the natural factors combined generated the extreme rainfall in this region (S.P. Sati and V.K. Gahalaut, 2013).

This catastrophic flood incident divided into two parts the first incident of the catastrophic flood occurred on 15 and 16 June catchment area of Mandakini, Sarasvati Rivers, and all channels were fully covered with highly intense water due the excessive rainfall or cloudburst. A metrological station was situated near the Chorabari glacier later destroyed by the flood, recorded 325mm rainfall on June, 15 and 16(Indian Disaster report,2013). One of the tributaries (Dudh Ganga) of the Mandakini originated from the left side of the slope. On the evening of 16 June 2013, most of its water speed and volume increased rapidly due to heavy rain and cloud burst. Because of the debris and rocks that flowed with it, the first demolished the bridge below the Kedar temple, and then by its confluence with Mandakini and its overflowing debris created a barrier on the way to Mandakini River. Due to obstruction the Mandakini River turned to the other side rather than its natural path and several channels generate (S.P. Sati and NK Gahalaut, 2013). Shankaracharya Samadhi, Jalnigam guest house, Bharat Seva Sangh Ashram, etc. all were destroyed on June 16. (Indian Disaster report, 2013).

The second incident occurred on 17 June 2013 when outbursts happened in the Chorabari Lake between Chorabari glacier and the Kedar shrine due to the excessive rainfall. Chorabari lake is located approximately 2KM above the Kedarnath shrine. The length, breadth, and depth of this are 400 meters, 200 meters, and 15-20 meters. The Chorabari Lake is a glacial fed and rainwater fed lake. The amount of water and debris increases with the heavy rainfall and landslides in the territory. The flood outburst happened in the Chorabari Lake, the water from the lake directly conjoining with Mandakini River. The complete water from the lake falls on the Kedarnath valley within 12-15 minutes of time causing havoc on the Kedarnath valley (Dobhal et. al, 2013). These two incidents cloud burst and glacial lake outbursts both were increased the water volume of Alaknanda, Mandakini, Bhagirathi, and other rivers. Kedarnath shrine area, Gaurikund, Rambara, Harsil, Uttarkashi, Guptakashi, Sonparyaga, Srinagar, etc. all were affected by heavy damage (Sharma et .al,2014).

On June 16, 2013, the Kedarnath (Uttarakhand) region faced advanced South-West monsoon activity, which generates a hydro-meteorological catastrophic incident in this region. In this time period Kedarnath (Uttarakhand) received extreme rainfall in 24 hours which was 120mm. Uttarakhand is very vulnerable and tender seismically and ecologically. Deforestation for the construction works was the major cause of this flash flood because it leads to damage to the forest ecosystem and

Kedarnath (Uttrakhand) which was covered with forest had fewer landslides in comparison to Flower valley, Nanda Devi Biosphere reserve, and some parts of Joshimath. 200 landslides had taken place between Kedarnath and Gaurikund. Many people and animals died in this catastrophic flood incident in the Kedarnath region. (Dr. Kavita Tariyal,2017).

Even in adverse circumstances in Kedar region 18-19 June 2013 several immediate actions like Aerial and ground rescues had done by NDRF, ITBP, the Indian army, and civil administration to provide food and water for flood survivors and to save them. Three choppers were also completely destroyed in this incident. Meanwhile, 6,817 and 18,183 flood survivors saved up by aerial rescues and ground rescues respectively (Piyoosh Rautela,2013).

Causes and Consequences

As above mention Kedarnath flood was the very devastating disaster of the past 10 years. This flood did not occur without any reason but there were some reasons which were responsible for generating this kind of disaster.

1. Factors and Conditions led to flood

- Combination of two wind systems in the region generated extreme rainfall: The two-week advancement of monsoon due to the low-pressure zone was generated in North India at that time. The westerlies were activated there as pre-monsoon showers.
- The position of Chorabari lake and the chorabari glacier over the Kedarnath town: Chorabari lake is situated at the Chorabari glacier and over the Kedarnath town, which is a glacial and rain-fed lake and was actually a moraine-dammed but due to extreme rainfall and glacial melting on 17 June 2013, the water pressure increased and the boundary of the lake broke up and the water flow with glacial debris out of the lake with high intensity.
- Mandakini and its tributaries originated and flow near the Kedarnath township: The originated points (snout Chorabari and its companion glacier) of Mandakini rivers and its tributary are situated near the Kedarnath region. Even these rivers flow near the Kedarnath township region.
- Unplanned construction works: Not only natural phenomenon was responsible for this devastating flood incident but anthropogenic construction activities and deforestation were also responsible.
- Debris flow and landslides had made this flood disaster more baneful.

2. The impacts of Disastrous flood

Kedarnath flood Incident had the worst impact on the Kedarnath region and even it adversely impacted the other districts of the Uttarakhand state. Several landslides had occurred in the Uttarakhand state in this catastrophic incident. Sonparyag, Jungle Chatti, Gaurikund, and Rambara were badly affected by the devastating flood event. Ramabara which is situated between Kedarnath and Guarikund was fully demolished in this. Five districts Uttarkashi, Pithoragarh, Rudraprayag, Chamoli, and Bageshwar were mostly affected by the flood due to their unplanned construction works.

Table-1
Evaluation of Losses and Impacts

Type of Loses	Total Number
Loses and impacts caused by flood	15,454
Damaged Bridge	145
Affected Village	4,200
Roads were destroyed	2,302
Houses were destroyed (Kuchha+Pucca)	3,360
Landslides on river beds and outstrikes of Bhagirathi, Mandakini, and Alaknanda	2,395
Highly affected districts	5

Source: K. Tariyal, 2017

Table-1 represented the loss and impacts of the flood that were caused by the Kedarnath itself. The major loss caused by the flood was 15,454 humans and animals lost their lives. In this flood disaster, 145 and 2,302 bridges and roads were destroyed. Total 4,200 villages were affected by the devastating flood incident and 5 districts were highly affected by the flood. Even flood had caused 2,395 landslides on the river bed and outstrikes of the river Mandakini, Bhagirathi, and Alaknanda. The 3,360 numbers of pucca and kutcha houses collectively destroyed by the flood.

3. Post-Disaster Actions

NDRF, ITBP, the Indian army, and the civil administration had played a vital role to save the survivors of the Kedarnath called it a war-like situation (Discovery Plus). The aerial and ground rescues had done by the NDRF, ITBP, Indian Army, and Air force to provide food and water to the flood survivor and save them. Several of temporary helipads were made landing the helicopter in the valley region. 60 choppers had used for rescues all over the state and out of them only 3 were completely destroyed and 3 crew members were also lost their lives. About 300-Million-ton food and other apparatus were provided by these choppers for the adversely affected areas (Discovery Plus). In the end, 25,005 flood survivors were collectively saved by aerial and ground rescues. Flood defense structures, Flood forecasting practices, and flood plain zoning strategies are made by the Uttarakhand government after this incident.

4. Probability of Disaster

Kedarnath region situated in the Garhwal Himalayan mountain range which is vulnerable and several tectonic activities took place inside this range which causes situation like earthquakes and landslides and even the topography of the area also lead the situation of a natural incident.

The Mandakini Valley flood plains are still active in this region which can lead to this kind of disaster in the future. According to scientists, the reconstruction work of Shankaracharya Samadhi near the Kedar Shrine below the glacier is very unscientific, because dig a big pit of 50 feet deep and 100 meters behind the Kedar Shrine is very inappropriate according to some scientists, few meters above the region there are glaciers and creating a road on the left bend of Mandakini river is very unscientific because the sediments on this side are very fragile in nature that means the left side is prone to landslides, this kind of construction will lead to a devastating incident again in the future.

No doubt that the region is vulnerable and fragile and will be led to a natural disaster in the future. No one controls natural calamity but humans can reduce their impact by their acumen and understanding. The construction works of the road, buildings, and bridges, etc. would be done in a very scientific way and planned manners and it is very important to these construction works should be done by the highly knowledge planners and engineers. Afforestation should be promoted for this reason and also in the whole state to reduce the impact of any kind of disaster. Local people should train to deal with such disasters and provide suitable equipment for dealing with floods. Disaster management should make suitable plans for the region and the people of this area should be driven to create such kind of building (in a planned way) those are suitable to deal with a natural disaster.

Conclusion

The Kedarnath which is situated on hilly terrain had faced severe damage on 15-18 June 2013 due to a catastrophic flood incident. During this flood several people and animals lost their life, number of hotels, houses, bridges, rest houses, and several hydroelectrically projects were destroyed in this region and others parts of Uttrakhand.

This region can lead to this kind of disaster again in the future because of its geology and geomorphology and due to the activeness of the flood plains of the region, according to some scientists, some faulty construction works will also lead to this kind of disaster in the future. So, it is important that, made suitable plans and trained the local people on how to reduce the impacts of the disasters.

And the government should rethink about those construction works according to them scientist told that this kind of disaster took place in the future in this region.

References :

1. Ashok Kumar Sharma, Surya Parkash & T.K. Saha Roy, 2014 Response to Uttarakhand Disaster 2013. International Journal of Scientific & Engineering Research, Volume 5, Issue 10, October-2014.
2. Dr. Kavita Tariyal,2017 Kedar TRAGEDY: A cause and Impact Assessment. International Journal of Science, Environment and Technology, Vol. 6, No 1, 2017, 493 – 499.
3. Dwarika P. Dobhal, Anil Gupta, Manish Mehla and Deen Dayal Khandelwal, July 2013. Current Science 105 (2): 172-173.
4. Indian Disaster Report,2013. National Institute of Disaster Management, Ministry of Home Affairs Government of India, pp. 11-16.
5. Piyoosh Rautela January,2013, Lessons learnt from the Deluge of Kedarnath, Uttarakhand, India. Asian Journal of Environment and Disaster Management Vol. 5, No. 2 (2013) 43–51, DOI: 10.3850/S1793924013002824.
6. S. P. SATI & V. K. Gahalaut,2013 The fury of the floods in the north-west Himalayan region: the Kedarnath tragedy. DOI: 10.1080/19475705. 2013.827135.
7. Times of India, Shivani Azad, March-29-2020, Why Scientists Think Kedarnath is at Risk again?
8. https://dplus.app.link/3OKFqxidxbb
9. https://dplus.app.link/bILF9y8cxbb
10. https://dplus.app.link/BjK9qy9cxbb
11. https://dplus.app.link/fBV4B39oubb
12. https://dplus.app.link/Xep3Uygdxbb
13. https://www.india.com/travel/kedarnath/

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