

Review Article

KEDAR TRAGEDY: A CAUSE AND IMPACT ASSESSMENT

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Abstract: A spell of torrential rainfall during June, 15-17, 2013, over Uttarakhand, India, caused devastating floods and landslides in the country's worst natural disaster since the 2004 Tsunami. The largest impact was at the temple town of Kedarnath, which saw the height of the annual pilgrimage season. India is still grappling with the effects of the flash floods that have destroyed a significant part of the Himalayas. It has been observed that huge rainfall drenched the area and suddenly exceeds the limit which is one of the reasons for commencement of landslides and exploded flood in the region that has caused huge damage to lives and property in the Mandakini valley. According to the government reports, a thousand died, more than four thousand went missing and scores of thousands remained stranded, waiting to be airlifted. The area is geodynamically unstable with neotectonic movements and high frequency of landslides, including rock falls, debris flow and ground subsidence. Disruption of communication and adverse weather and terrain conditions complicated the situation and people could not be rescued in time. This paper is an attempt to reconstruct the sequence of events as also to highlight the constraints faced on ground. Lessons learnt from this tragedy can help in smooth lining various disaster management related functions for future.

Keywords: Disaster management; Flood; Himalayas; Kedarnath; Landslide.

Introduction

Kedarnath is one of the ancient and famous pilgrims place situated in Uttarakhand, India. It is located in the snow cover area of Himalayan region at the height of approx 3,583 meter above sea level in the Mandakini valley of Rudraprayag District, Uttarakhand. Due to very decisive weather condition it is not possible to visit this Holy place for all of the years so only from May to October it is safe to visit there. The race between tourism industries, population growth, several hydroelectric projects are in the fast track in Uttarakhand district. After the constitution of Uttarakhand as State there is an increment of approx. 141% in population of Uttarakhand. Now a day's lots of residents and villagers have started to live near the temple and commercialize this holy region by building different hotels, shops and markets in this

valley. It is clear that there is tremendous growth in infrastructure during last few decades and proportionally the number of pilgrimages has been increased to a greater extent. This region is seismically and ecologically very sensitive and delicate even a minute changes (anthropogenic or natural) can create a dangerous disaster. As per the different news agencies it was reported that nothing is left there, just nothing. The entire area, which housed around 100-150 shops and five hotels, to serve the needs of the ever swelling number of pilgrims, was completely washed away leaving no trace of the once lively rural community situated at an altitude of 2591 metres halfway on the 14 km long track to Kedarnath (Sharma *et al*, 2013). The catastrophe that took place in the Indian state of Uttarakhand on June 16, 2013, in the wake of premonsoon rains, was a tragedy waiting to happen. The rainfall of 120 mm within a span of 24 hours caused the flash flood in Kedarnath. This in turn proved deadly for human lives and destruction of property. According to the government reports, a thousand died, more than four thousand went missing and scores of thousands remained stranded, waiting to be airlifted. Kedarnath, a centuries-old historic town, was reduced into a haunted place in no time.

The horrific disaster that struck Uttarakhand has been assessed as a mix of natural and man-made reasons. Although cloudburst and landslides were the main causes of this disaster, nature alone can't be blamed for this unfortunate turn of events. Man has played an equal, if not greater, role in this disaster. Poor disaster management infrastructure, lousy building constructions, massive deforestation, erroneous agricultural practices on barren hill slopes, unscientific road building and quarrying contributed to make this India's worst flood disaster. Natural phenomena can sometimes strike very hard and cause disasters if preventive measures are not taken or if some human activities have harmed the natural environment or upset the balance of the ecosystem. Ecologists point out that the huge expansion of hydro-power projects to meet the growing demands of the expanding state and construction of roads to cope with the lakhs of tourists in Uttarakhand compounded the scale of the disaster. The incessant construction work also resulted in increased surface flow and rise of river bed due to disposal of debris in the rivers. There has been excessive deforestation in these areas to make way for construction in the name of development.

Uttarakhand Disaster: Man Made Calamity

Environmentalists blame unsustainable developmental activities in Uttarakhand state, undertaken in recent decades for the massive destruction by the rainfall, which contributed to

high level of loss of property and lives. The three key reasons can be identified in the context of Uttarakhand Disaster (Kumar, 2013):

1. Deforestation

Deforestation aggravated floods in Uttarakhand. The maximum forest area diverted for hydel projects, roads and transmission lines has been in districts like Chamoli, Rudraprayag, Uttarkashi and Pithoragarh – the most badly affected by the floods. The forest eco-systems have been severely damaged due to large number of development projects. As per reports from the Union Ministry of Environment and Forests (MoEF), 44,868 ha of forest land have been diverted to non-forest use in Uttarakhand since 1980. Such deforestation has aggravated the impact of floods in the state. Local environmentalists share their earthly wisdom and narrate wherever there has been intact forest, the damage from floods was much less than where it has been diverted to non-forest use. For instance, in Kedar Valley there have been very few landslides in comparison to the Valley of Flowers, Nanda Devi Biosphere Reserve and regions around Joshimath where the villages have been devastated by landslides along with the cloudburst, as the native oak forests of the region have great soil-binding capacity and water retention power (Kumar, 2013).

2. Haphazard construction work

The valleys of the Yamuna, the Ganga and the Alaknanda witness heavy traffic of tourists especially the pilgrims who visit the holy places in the state annually. According to the Uttarakhand Tourism Department reports, in the past decade, the number of tourists has risen by 155 %. The state's population is 14 million. However last year alone, 28.4 million tourists visited the state between May and November. A survey done by the Indian Council for Research on International Economic Relations in 2006 states that there is an average of 102.5 hotels per million tourists in the state. Shortage of dwelling units has led to mushrooming of illegal structures, some right on the riverbanks. For this, the new roads have been constructed and existing ones was widened without assessing the carrying capacity of the Himalaya. The state government's notification in the year 2000 to prohibit construction within 200 meters from the riverbanks was not adhered to. The mountains were cut to make roads haphazardly that rendered the mountains unstable. In 2005-06, nearly 83,000-odd vehicles were registered in the state. The figure rose to nearly 180,000 in 2012 -13. It has been well established that there is a direct co-relation between tourism increase and higher incidence of landslides (Kumar, 2013).

Impact of the Disaster

The ensuing disaster was statewide. Big and small rivers and mountain streams throughout the state burst their banks wreaking havoc in nearby villages. The heavy rains destabilized mountain slopes causing landslides at thousands of locations. The main impact was felt near the more fragile high ranges. Table 1 gives the preliminary assessments data compiled by different agencies. Though some of the numbers were not definite, they revealed the scale of the catastrophe. The following paragraphs briefly describe the nature of the impacts.

Floods: Flash floods are a common occurrence in the Himalayas but the destruction at many locations this year was very unusual. Large rivers like the Ganga, Kali, Saryu and Ramganga (E) breached their danger marks. The Ganga inundated Rishikesh and Haridwar. Its tributary, River Bhagirathi, flooded parts of Uttarkashi while the Alaknanda drowned parts of Srinagar under 30 feet of water, mud and silt. The Mandakini level rose 30 to 50 feet in its lower reach, near Rudraprayag (Chopra, 2014). Floods affected every part of the state; rural and urban areas alike. The Yamuna inundated Vikasnagar (Chopra, 2014).

Landslides: In a preliminary assessment, Indian Space Research Organization (ISRO) identified 2,395 landslides in various parts of the Mandakini, Alaknanda and Bhagirathi watersheds (www.bhuvan-noeda.nrsc.gov.in). Almost 200 of them were between Kedarnath and Gaurikund. Road and telecommunication links were severely affected (Chopra, 2014).

Loss of infrastructure: Infrastructure in Uttarakhand was badly hit. Roads, bridges, power lines, irrigation canals, drinking water supply systems, telecommunication towers and hotels and houses were destroyed or damaged. Officials valued the lost structures at tens of billion rupees (www.tehelka.com). The consequent business losses were similar. Most of the severe damage was in the northern districts of Uttarkashi, Rudraprayag, Chamoli, Bageshwar and Pithoragarh. Government data showed that 145 bridges had been swept away and that roads were damaged at over 2300 locations. A rampaging Mandakini river swept away most bridges across it. The over 100-years old bridge connecting India to Nepal at Jauljibi was washed away by the Kali river. In some places people drowned trying to cross swollen mountain streams on makeshift bridges (Chopra, 2014).

Life and Livelihoods: The human tragedy resulting from the disaster is grimmer. Without homes, lands and livestock, the basic livelihood assets of thousands of rural families, restoring livelihoods will be a major challenge. The abrupt end of the yatra season and its unlikely resumption on this scale in the near future will impoverish thousands of families whose men service pilgrims and tourists on the yatra routes. They operate taxis, buses,

lodges, dhabas and stalls; some guide people who ride their horses or ponies while others are porters carrying the young, old and infirm on their backs or in palanquins on their shoulders. Thousand of these people and the animals were simply swept away by the deluge at Kedarnath (Chopra, 2014). Manmendra Singh of Mandakini-ki-Awaz, a community radio station in the Mandakini valley, says, “All-women households are numbed by the thoughts of coping with the future.”⁸ Aid agency workers have expressed fears of trafficking of women and children in this region by anti-social elements preying on such vulnerable families (www.in.reuters.com).

Table 1: Preliminary Assessment of Kedar Tragedy 2013 (Source: Chopra, 2014)

S No	Nature Of Damage	Numbers
1	Affected persons	5 lakhs (approx)
2	Affected villages	4,200
3	Severely affected villages	over 300
4	Persons injured	4,463
5	Number of dead persons	over 900*
6	Number of missing persons	5,748
7	Number of pukka houses damaged	2,679
8	Number of kuccha houses damaged	681
9	Number of animals lost	8,716
10	Number of roads destroyed	2,302
11	Number of bridges washed away	145
12	Number of drinking water schemes damaged	1,418
13	Number of villages without power	3,758

Lessons learnt

The complete destruction by Mandakini River in Kedarnath on 16 and 17 June 2013 could not have been avoided. Yet, the number of casualties would have been far less had the mushrooming growth of hotels, lodges and dharmshalas not been allowed in Kedarnath. This has been one of the worst Himalayan tragedies in recent years in which the exact number of people buried/perished is not known as thousands are still missing. Almost the entire Rambara and a large part of Gaurikund and many villages of Mandakini valley were also wiped out. The flash flood and attendant debris flow was undoubtedly an irrepressible natural hazard. However, its worst impact must be viewed in the perspective of high vulnerability (of this area) mainly attributed to rampant construction activity for commercial purpose in Kedarnath, Rambara and Gaurikund in the close proximity of Mandakini River and also the

uncontrolled floating population of pilgrims. It was the worst-case scenario with an area of very high vulnerability (man-made) experiencing flash floods and debris flow induced by torrential rains, Chorabari lake collapse and mobilization of glacial material (Dobhal *et al*, 2013). This correspondence discusses the measures aimed at reducing the vulnerability of this area in the future.

The area is geodynamically unstable with neotectonic movements and high frequency of landslides, including rock falls, debris flow and ground subsidence (Uniyal *et al*, 2008; Valdiya, 1981). The source of the Mandakini River is formed by Chorabari and an unnamed companion glacier. The settlement of Kedarnath is just 500 m below the snout of these glaciers and the terminal moraine hump is about 275 m high from the outwash plain over which Kedarnath is situated (GSI, unpublished). Examination of satellite images indicates that this outwash plain might have been reworked by the Mandakini River in the past and a major part of Kedarnath till 16 June 2013 was located on the old flood plain (T1 terrace). However, the famous Kedarnath temple constructed on a manmade raised platform seems to be located on a higher terrace of the Mandakini River. The moraine ridges running parallel and subparallel to the upper Mandakini valley are conspicuous in Kedarnath and further downstream up to Garuriya and Ghindurpani. After the flash floods and debris flow of 16 and 17 June 2013 (although flood water of the Mandakini River has receded), it would not be geologically incorrect to say that the completely devastated settlement of Kedarnath today lies on the active flood plain of Mandakini River that may be flooded again in the near or far future in the event of torrential rains and or due to mobilization of glacial material.

Conclusion

Recent Uttarakhand disaster on 16th and 17th June, 2013 speaks volumes about irrational human actions and unscientific approach in the name of so called development resulting in a great tragedy. The irreversible damage done to the basic components of environment due to cutting down of forests, buildings roads for promoting tourism, unplanned structures, setting up industries and constructing hydroelectric plants etc all contributed to what mankind will never like to see again. The need of the hour is to reflect, examine and understand the natural as well as man-made factors responsible for the misfortune. The present text intends to initiate debate and generate ideas as to what actions need to be taken on the part of individuals, social groups and the government to strike a better balance between economic developments and environmental concerns. It was our mistake during the recent years to commercialize the holy shrine of Kedarnath. Now it would be a blunder on our part to do so

again. In the near future we may not have the technology to prevent or even precisely predict the time and area that will be affected by flash flood and debris flow events, but we can drastically reduce the vulnerability of the population of pilgrims, tourists, shopkeepers and locals to such hazards. The big question that remains unanswered is, are we prepared to restrict the Kedarnath type commercialization in other Himalayan, shrine areas, namely Yamunotri and Janki Chatti ? Are we ready to pay the price for not commercializing shrines such as Kedarnath and Rambara again?

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