

Uttarakhand Disaster: Facts, Causes and its Psychological Impact

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ABSTRACT

The word disaster implies a sudden overwhelming and unforeseen event. Disaster is a serious disruption in the functioning of Community or a society causing widespread material, an economic, social or environmental loss that exceeds the ability of the affected society to cope using its own resources. In light of the disaster that occurred in Uttarakhand, were a cloud burst caused flash floods that swept the state, resulting in massive destruction, loss of life and left thousands of tourists stranded. A natural hazardous has been happened in Kedarnath valley due to torrential rainfall during 16 and 17 June 2013. Kedar nath is a town located in the Indian state of Uttarakhand and has gained importance because of Kedarnath Temple located at the latitude of 30.73 and the longitude of 79.06. This region is seismically and ecologically very sensitive and delicate, even a minute

changes (anthropogenic or natural) can create a dangerous disaster. A disaster disrupts the existing social structure and makes it difficult for the usual social mechanisms to manage the consequences. Problems resulting from disasters are many and are not limited just to those of a physical nature. Different Variables that may moderate the impact of disasters, includes the ability of survivors to adjust psychologically, the capacity of the community structures to adapt to the crisis and the amount of help available. The Present paper attempts to develop an in-depth perspective about what happened on 16th June, 2013 in Uttarakhand State. It will explore geography of the Uttarakhand state and nature of the disaster. In addition, it also deals with the various causes of the Uttarakhand-flood disaster, issues related with this great disaster and the management of these types of disasters with possible mitigation.

Keywords: *Disaster, Flash floods, Psychological impact, Mitigation.*

1. INTRODUCTION

Uttarakhand, known as the “Dev Bhumi” or the Land of the Gods for its spiritual identity and is one of the ancient and famous pilgrimage place situated in Uttarakhand, India. Kedarnath is located in the snow cover area of Himalayan region at the height of approximately 3,583 meter above the sea level in Mandakini valley of Rudraprayag District of Uttarakhand. This region exerts a very critical weather conditions and is not possible to visit this Holy place for the whole year so only from May to October it is safe to visit there. The major catastrophe took place in this Indian state of Uttarakhand on June 16, 2013 in beginning of pre-monsoon rains that resulted into a huge tragedy waiting to happen. Continuously for four days unparalleled rains (400 mm) during mid-June 2013 resulted in huge flash floods followed by Land-slides at different places. A sudden flow of water entered the centuries- old Kedarnath temple, and washed away everything in its vicinity and nearby area in a matter of minutes. According to the reports, more than six thousand pilgrims died and more than four

thousand went missing and scores of thousands remained stranded, waiting to be airlifted. In one of the largest rescue operations in the World, Army deployed 10,000 soldiers and 11 helicopters, the Navy sent 45 naval divers, and the Air force deployed 43 aircraft including 36 helicopters in Uttarakhand flood-hit districts of Rudraprayag, Chamoli and Uttarakashi, to save and airlift the stranded pilgrims and localites and this rescue operation named as ‘Mission Rahat’ ended on 2nd July, 2013 after the 17 days of enormous work with the evacuation of over 1,10,000 people. Overflowing rivers washed out many lodges/hotels and human settlements and destroyed thousands of hectares of agricultural and forest land and Kedarnath, centuries-old historic town, was converted into a haunted place in no time.

The research team from GBPIHED, Garhwal Unit (GU) estimated that approximately 10-15 years will be required to restore the tourism-based economy and infrastructure of the Kedarnath town. In addition, post-disaster, local inhabitants in the Kedar valley are facing different challenges due to food insecurity and insecurity regarding the future as the economy of the region was mostly based on

tourism. Such a terrific situation is of the serious concern to the government and its several departments and poses several challenges for the formulation of appropriate strategies and their execution. The competition between tourism industries, several hydroelectric projects are in fast track in this state. Large number of residents and villagers have now started to live near by the Kedarnath Temple and commercialize this holy region by building different hotels and market places in this valley and thus it is clear that there is tremendous growth in the infrastructure during the last few decades and proportionally the number of pilgrimages has been increased to a greater extent.

2. GEOGRAPHICAL LOCATION OF THE AREA

The Kedarnath temple is located in western extremity of the Central Himalaya ($30^{\circ}44'6.7''N$; $79^{\circ}04'1''E$) in Mandakini river valley which has a total catchment area of $\sim 67 \text{ Km}^2$, out of which 23% area is covered by glaciers (Mehta et al., 2012). The catchment area is situated in glacier modified u-shaped valley; its altitude ranges from 2740 to 6578m. Bhart Khunta (6578m), Kedarnath (6940m), Mahalaya peak (5320m) are few well known peaks in this area.

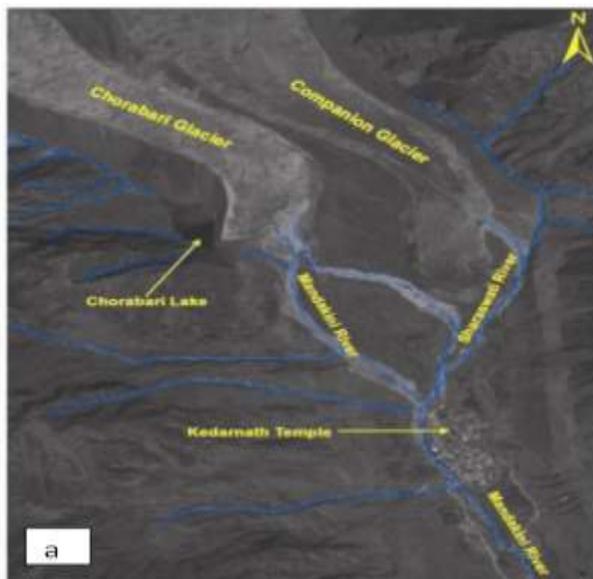
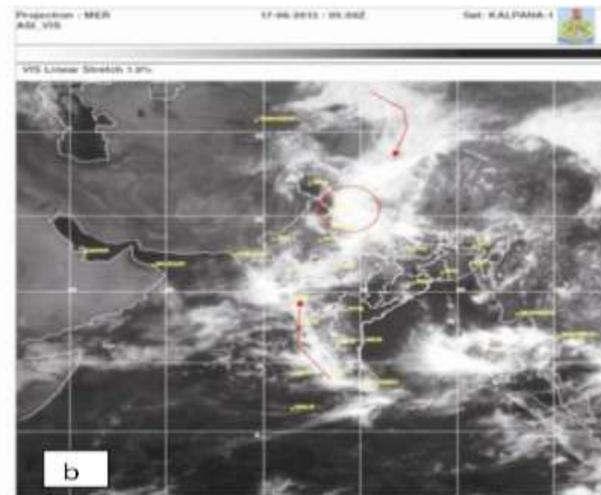


Figure 1.a, Satellite view of Kedarnath area, showing drainage system, glaciers, lake and



township; b, The India Metrological Department image (17 June, 20

13) reflecting heavy rainfall on higher Uttarakhand, Himachal and Nepal Himalaya that caused the collision of the monsoon and westerly disturbance. Arrows

(red colour) on map indicate the moisture sources of the area.

(Source: Figure 1b: <http://www.imd.gov.in/section/satmet/dynamic/insat.html>)

Mandakini river originates from Chorabari Glacier (3895m) near Chorabari lake (Figures 1 and 2) and joins Saraswati river which originates from Companion Glacier at Kedarnath (Figure 2) passing through Rambara and Gaurikund. The Madhu Ganga

and Dudh Ganga are the main tributaries that merge into the Mandakini River at Kedarnath town. Another equally important tributary of Mandakini River is Son Ganga which originates from Vasuki Lake (4040 m asl) and has a confluence with Mandakini River at Sonprayag (1709 m asl) which finally merges with Alaknanda River at Rudra-Prayag. Geologically, north area of Pindari Thrust comprises calc silicate, biotite gneisses, schist and granite pegmatite apatite veins belonging to Pindari Formation (Mehta et al., 2012).



Figure 2. Geomorphological setup of the Kedarnath area and view of settlement of the Kedarnath town along the river bank of Mandakini.

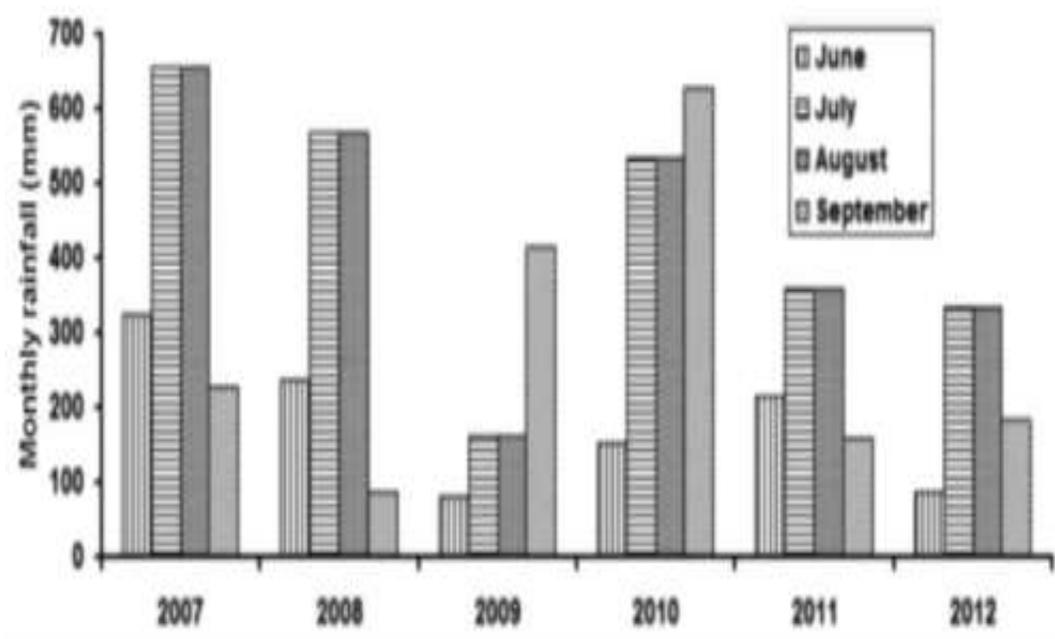


Figure 3. Histogram of summer rainfall pattern of the Kedarnath area during the period 2007 to 2012 AD. Maximum precipitation occurred during the rainy season from July and August5.

Geomorphologically, Mandakini valley was formed by erosional and depositional processes of glaciofluvial origin. The Kedarnath town is situated on outwash plane of Chorabari and Companion Glaciers (Figure 2). The channel of Mandakini and Saraswati Rivers encircles this outwash plane and meet near the Kedarnath town. These streams cut their banks every year. Overcrowding of the people near the temple led to a change in the course of Saraswati River which now flows just behind the Kedarnath town (Figure 2). Downstream near Rambara and Gaurikund the houses have been built on the old colluvial or fluvial deposits which are loose and prone to

landslides and river cuttings. Rainfall data from an automatic weather station (installed near the Chaorabari snout) indicates that the Indian Summer Monsoon is the major source of precipitation (Rainfall) in the study area with partial contribution from the western disturbances during winters. Winter precipitation generally occurs between December and March when western disturbances are dominant in the area as they move eastward over northern India. Total summer (JJAS) rainfall for each observation periods between 2007 and 2012 were 1685 mm, 1513 mm, 734 mm, 1662 mm, 1348 mm, and 1115 mm for the respective years. Based on the available rainfall data from our

observatory at Chorabari Glacier, the area received maximum precipitation during the rainy season, i.e. July and August (Figure 3).

3. METHODOLOGY

Published material and opinions given by various eminent scholars, environmentalist and researchers have been observed and analyzed in order to understand the various aspects of the problem and its preclusion.

Extensive literature review was done in order to understand the research earlier conducted on the similar issues and to collect information about the fragile nature of the world's largest mountain range, i.e., the Himalaya.

4. PLAUSIBLE CAUSES

Various reasons were found to be involved behind this devastation in Kedarnath area of Uttarakhand State which is stated as follows:

UNUSUAL BEHAVIOR OF MONSOON

In 2013, Uttarakhand received early rainfall and the monsoon winds arrived almost two weeks earlier. Further, glaciers melt faster as water falls on ice, and the huge run-off began to engorge the river that resulted into heavier flow of water in the rivers. Another reason is that Hiamlayas are the world's

youngest mountain range and they are prone to erosion; landslides, seismic activity and brutal rainstorms which swept away the region very badly. Uttarakhand region is very vulnerable and fragile. It reflects direct link between climate change and the changing rainfall patterns in Himalayas. Further, Indian Institute of tropical metrology in Pune asserts that 'modearte' rain events are on the decline and the intense rain events are on the increase and it is such a bad news for the Himalayas as it clearly reflects that this region is highly prone to cloudbursts and unexpected high rainfalls- as it happened on June 16 when in just few hours rains lashed away the huge parts of Uttaranchal and Himachal Pradesh and its adjoining areas of the State.

HIMALAYAN TSUMANI: MAN MADE CALAMITY

An environmentalist blames unsustainable developmental tasks in the state, for the massive devastation, which contributed to high level of loss of property and lives. The major contributory activities are as follows:

Deforestation

From the last few years, maximum forest area was cleaned for hydel projects. Roads

and transmission lines have been setup in districts like Chamoli, Rudraprayag, Pithoragarh and Uttarkashi- the most badly affected areas by the floods. The forest ecology has been severely damaged due to large number of development projects established there. This deforestation increased the risk of floods in State. Environmentalists stated that the damage was much less in areas which were covered by dense forest as compared to non-forest areas. In Kedar valley, there have been very few landslides as compared to the valley of flowers, Nanda Devi Biosphere Reserve and areas adjoining Joshimath where the villages have been devastated by landslides along with the cloudburst.

Mass Tourism

Uttarakhand is very much famous for various high altitude pilgrimages as well as for its panoramic beauty and Tourism is the backbone of Uttarakhand's economy, but it is now clear that visitors and pilgrims number exceeds too much. According to Official website of Uttarakhand Tourism Department, total of 28,433,000 tourist visited the state in 2012, among them 28,292,000 (99.50%) were domestic and rest 1, 41,000 (0.5%) were foreigner (CNN-IBN

Live 18, 2013). This number is expected to get doubled by 2017, with the state ready to welcome 77.7 million domestic travelers and nearly 400,000 foreigners (United way of India, 2013). The Char Dhams are all not only high altitudinal areas but also eco-sensitive areas. In spite of this a huge amount of pilgrims visit these Dhams annually. Even, people were staying at Kedarnath before the huge disaster. But from the last few decades, the this yatra was getting tough for people and they used to scare to halt there. In 2012, 5,73,040 tourists visited the Kedarnath, but actual figure exceeds more than this official data. With the advent of communication, the Chardham Yatra has become so pleasurable that in 2012 total 2,223,691 people visited the four places within a year. After 2000, there was a speedy invasion in number of tourists in Uttarakhand State up to 2010 and in 2011 the number of tourists was slightly less due to recess. Overall, the numbers of tourists are too much and has crossed the total population of the state i.e. 1.01 crores (near about 10 millions) (Rediff.com, 2013).

Haphazard Construction Work

The valleys of the Yamuna, the Ganga and the Alaknanda witness profound rush of

pilgrims who visit the holy places in the state annually. 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 lodging units led to the rapid increase in illegal structures, on riverbanks. For this purpose, the new roads have been constructed and existing ones were widened without assessing the carrying capacity of the Himalaya. The state government had given notice in year 2000 to prohibit construction within 200 meters from the riverbanks but was not adhered to. The mountains were cut down to make roads randomly that left the mountains unbalanced. In 2005-06, nearly 83,000 odd vehicles were registered in the state and by 2012-13 this figure raised to approximately 180,000. It has been well established that there is a direct co-relation between tourism increase and higher incidence of landslides.

Constructions of Various Dams and Reservoir for Hydro Projects:

After the separation from Uttar Pradesh (9th November 2000), the state authority stressed hydro power sector to boost the state economy. Uttarakhand has enough water wealth; the state is perfectly endowed with

glacier melt water and seasonal Monsoon Rainfall. All Rivers are perennial in nature. Uttarakhand is the main catchment area of Ganga. This state has an estimated hydro potential of 27191.89 M.W and so far 3598.665. M.W has been harnessed up to 11th plane period, it is only 16% of its hydro potentiality (All Dams and Hydropower Projects on Ganga, 2012). In a recent report in 2011 the World Bank stated that Hydropower potential is one of the most important strategic assets of the state of Uttarakhand for its economic development. Therefore, the state authority plans to increase the production of Hydro power to be self sufficient and export to NCR and other part of the country. To achieve its hydro potentiality a large number of projects are already in advance stage of planning or execution and many more projects are being proposed in Bhagirathi and Alakananda basin. The below table shows basin wise all type of Hydro projects (Large, Small, Mini-micro) with their installed capacities. Uttarakhand government has plans to have total of 336 hydropower projects with total capacity of 27191.89 MW. Largest numbers (122) of such projects are in Alaknanda basin, the largest capacity is proposed to be in Sharda basin at 12450.905 M.W (All

Dams and Hydropower Projects on Ganga, 2012).

Unplanned Urbanisation

During recent years the growth of urban population in Uttarakhand has increased rapidly mainly in Dheradun, Haridwar, Nainital and Udham Sing Nagar districts. Expansion of road network, development in tourism, improvement of market, growth of rural service centres etc are the major factors for the urban growth. There were few old urban centres in the state, Dehradun, Nainital, Mussoorie, Sirinagar etc. Presently there are 86 urban units in the state, among them 1 Municipal corporation, 31 Nagar Palika Parisad, 9 Cantonment Boards, 12 census town and 2 industrial township (Uttarakhand Tourism Development Master Plan, 2008). In 2011 Census the percentage of urban population is 30.55%, very close to National average i.e.31.16% (Rediff.com, 2013). Within five decades it is near to double. But, rapid growth recorded mainly within 2001-2011, after separation from U.P.

The urban centers like Devprayag, Sonprayag, Rishikesh, Bardinath, Rudraprayag, Gopeshwar Rudrapur etc have been developed as stoppage centre of

Chardham Yatra. Seasonal economic activities gave them opportunity to develop as small or medium towns. After 2000, the populations of these towns and cities have been rapidly increased due to mass tourism, related job opportunities. In this way a large numbers of the unplanned urban bodies were evolved without basic civic amenities and infrastructures. These unplanned urban bodies are major threat to the whole river system of the state. Non degradable solid wastes and several pollutants are being dump in rivers that hampering hydrological cycle, river ecology and morphology. Holy lakes and confluence that have spiritual values as well as environmental importance are polluted by uncontrolled discharge of waste water and solid waste. The jungles of concrete are putting extra pressure on weak lithology of hill slopes, causes more landslides than past.

5. PSYCHOLOGICAL IMPACT OF THE DISASTER

Disasters are events that vary from other types of potentially traumatic events. They are the events that challenge the individual's capacity for adaptation which resulted into adverse mental health outcomes including serious posttraumatic psychopathologies. It

may persist for a prolonged period of time after the event and represent a burden to the individual whose physical and emotional resources have already been depleted by their losses. A typical pattern of mental, emotional, and physical response is observed among the majority of people exposed to disaster. Earlier research suggests that for natural disasters such as volcanos, tornados and floods, psychological consequences may persist as long as 3 years, though symptoms seem to fade by 16 months (Bravo et al., 1990; Krause, 1987; Shore et al., 1986; Steinglass and Gerrity, 1990). The Government of India designated National Institute of Mental Health and Neurosciences (NIMHANS), Bengaluru, as the nodal agency for assessing and coordinating the psychosocial relief in this Himalayan tsunami affected region. Accordingly, a multidisciplinary team was deputed to Uttarakhand with the mandate of identifying and treating persons needing immediate interventions and for assessing psychiatric/psychosocial morbidity.

Aftershocks of the catastrophe that hit Uttarakhand are being felt by large number of people. The survivors suffered from psychological trauma, depression, insomnia and many other sleep disorders.

Those who lost their dear ones are having nightmares, bouts of anger, depression and suicidal thoughts as told by Dr Sunil Mittal, Director Delhi Psychiatric Centre. Going by the extent of devastation and deaths in floods, people suffered from deep psychological shock and even some developed symptoms of frank psychosis and lacking a grasp on reality. The mental health of those affected is of very serious concern. Proper coordination needs to be given to the agencies providing mental health support.

6. CONCLUSION

Flashfloods of Uttarakhand in 2013 is one of these devastating disasters in Himalaya as well as world history. There should not be any doubt that ruthless human desire for rapid development has increased and accelerated the impact of the disaster. Mother Nature has given a lesson to all those who are in rat race to control nature for their profit. After the death toll and long suffers, everybody is asking for the remedies. Actually, no one can prevent this short of catastrophic event; it is truly an „Act of God’. But we can minimize the impact of such disaster keeping in mind – “Prevention is better than cure”. If we

follow these matters, situation won't be so worst in future –

7. SUGGESTIONS

1. Construction of Big dams on such delicate areas like Uttarakhand (major portions of the state fall in seismic zone) is a dangerous task. Before the construction of big dams, proper investigation is very much needed through Environmental impact Assessment (EIA). For a proper EIA report, a multi disciplinary (with the collaboration of social scientist, engineer, environmentalist and civil society) task force is needed to investigate the socio-environmental challenges associate with the proposed projects. But it is a matter of regret that there are great difference in between EIA report of Govt. agencies and independent expert committees. For example, in April 2010, an independent expert committee of non-official members and expert of National Ganga River Basin Authority or NGRBA made a socio-environmental study of the under construction Hydro projects such as

Koteshwar on Bhagirati; Singoli Bhatwari and Phata-Bhyung on Mandakini and Srinagar, Vishnugangad, Pipalkoti on Alaknanda. After the study they have suggested to stop these projects immediately because these projects are vulnerable for natural river courses (Times of India, 03 July 2013). Before construction of all the proposed dams in the state, the state and Central agencies must ensure that these projects won't submerge the important holy confluences. Otherwise the river morphology and ecology will be disturbed. For example, the projects of Devsari on Pinder River and other three projects Kotlibhel will submerge the confluence of Dev Prayag (Times of India, 03 July 2013). So, these projects should be cancelled immediately.

We should avoid the vulnerable areas (high terrain with slope factors and weak lithology) for big dams. Instead of big dams we can construct small dams (like check dams) in upper catchment areas according to the stream order and distribution of contours. Size and the height of these dams

must be increased according to their stream order. It is also very important to maintain enough distance between two dams so that the natural flow of the rivers won't be interrupted. In this way an ascending order of dams in the catchment areas can be delayed the flood and provides relatively much more time to evacuate the people from lower areas. This type of dams can also play a vital role in village electrification generating the hydro power as well as can provide irrigational water.

2. The best way to prevent landslide in high mountain areas is to return back of Oak trees. It has proven that oak has the capability to compaction the lithology with organic matters than pine or other gymnosperms. Forestation of oak can be accelerated with social forestry with the cooperation local governing bodies and participation of local inhabitants.
3. With the early warning system, effective evacuation plans and responsive disaster management group should be prepared with the proper guidance and assistance with National Disaster Management Authority (NDMA). These groups can be deployed block wise with

active Participation of local inhabitants.

4. There should be strict restriction on mass tourism in Eco-sensitive zones especially in Char Dhams, Valley of Flowers and several glaciers and snouts areas. Annual quota of tourists or pilgrims should be introduced in these areas like Kailash –Manasarovar Yatra. Environmental Tax must be collected from the tourists and vehicles to regulate the influx vehicular movement in high terrain areas. Heavy Duty vehicles should be prohibited in slide prone areas and regular monitoring should go on.
5. To meet the twin objectives of ecological sustainability by conserving biological diversity and ensuring needs of the forest dependent communities through sustainable harvesting of natural resources it is important to strengthen the existing egalitarian and traditional resource use practices among the local communities. Ecotourism and particularly Community-based tourism have the potential to be more

suitable livelihood option and to make substantial positive contribution to management and conservation of forest and wildlife.

6. Construction of buildings and structures on unstable hill slopes and young flood plains must be restricted. Multi storied buildings on high terrain area should not be developed, this type of structures put excessive load on lithology that causes landslide.

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