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Improving the science and evidence base of disaster response: A policy research study on Uttarakhand

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Abstract
Responding to natural or man-made disasters, in a timely and effective manner, can reduce deaths and injuries as well as economic losses. Based on the assumption that better information leads to effective decision-making and more effective crisis response performance, research projects have emerged that apply advanced IT solutions in the field of crisis management. This research paper provides an overview of the most recent projects, in the Uttarakhand. Moreover, the study highlights that the use of robust and scalable IT solutions can greatly facilitate access to the right information, by the right people and organizations, at the right time.

Keywords: effective decision making response, use of technology, Disaster response, Humanitarian crises, Evidence-based disaster response, social issues

Introduction
Disaster is a devastating event which disrupts the normal life. Disasters are not new to human beings. Everyone living on the face of earth is living under the shadow of disaster of diverse types. Natural disasters are an area of multi-disciplinary research and policy analysis. There is therefore a problem of discourse, because basic terms in the language of disaster research and practice are apparently common but often reflect slight differences of conceptualization amongst natural scientists, social scientists and practitioners. This problem of discourse is common to most development issues. (Apthorpe, 1984; Harris, 2002). It makes it necessary to state very clearly at the beginning of an investigation such as this, which covers less explored aspects of natural disasters as an economy worldwide. A natural hazard is an atmospheric, geophysical or hydrological event that has a potential to cause loss or damage. These are uncommon and extreme events in terms of the range of natural phenomena such as rainfall, tropical storms, floods or earthquake. A natural disaster is the occurrence of an abnormal or infrequent hazard that impacts on vulnerable communities or geographical areas, causing huge damage and destruction. There may also be severe impacts in terms of financial flows, such as revenue and expenditure of public and private bodies. A Natural calamity such as floods, earthquakes, landslides, cyclone, etc. as well as manmade counterparts such as nuclear, chemical and biological weapons, bomb, terrorism, and fire keep occurring year after year in various parts of the earth. They constitute threat to people, substructures and monetary assets. They obstruct the development of commerce, countries and the global economy. Disasters have unfavourable social as well as financial impacts which persist for a very long period. Natural disasters cause significant budgetary pressures, with both narrowly fiscal short term impacts and wider long term development implications. Real location is the primary fiscal response to disaster. Over the last few years the occurrences of disasters and their impacts on the financial conditions have increased. Global economic losses due to disasters are also increasing. It is a serious disruption which exceeds the ability of the affected community or society to cope using its own resources.

At the day of June, a cloudburst centred on the North Indian state of Uttarakhand caused devastating floods and landslides becoming the country's worst natural disaster since the 2004 tsunami. The reason the floods were on such a larger scale than the regular floods the state usually received was because of the debris of the building of dams upstream. The debris blocked up the rivers, causing major overflow. The main day of the flood is said to be on 16 June 2013. Though some parts of Himachal Pradesh, Haryana, Delhi and Uttar Pradesh in India experienced the flood, some regions of Western Nepal, and some parts of Western Tibet also experienced heavy rainfall, over 89% of the casualties occurred in Uttarakhand. As of 16 July 2013, according to figures provided by the Uttarakhand government, more than 5,700 people were presumed dead. This total included 934 local residents. Destruction of bridges and roads left about 100,000 pilgrims and tourists trapped in the valleys leading to three of the four Hindu Chota Char Dham pilgrimage sites. The Indian Air Force, the Indian Army, and paramilitary troops evacuated more than 110,000 people from the flood ravaged area. Hoffman (1999) explains that, for the external eye, when analysing the "disaster" but not being affected by it, things may seem normal or return to normal after a disaster. They fail to see those who

still suffer the impacts of the disaster, or in other areas, depending on government contributions and socio-economic structure, the projects will be abandoned and the areas will look like they did when the disaster happened, causing the viewer external to think that everything is fine.

Objectives

1. To understand financial aspects of preparedness and prevention before the disaster occurrence as compared to the costs of rehabilitation after disaster
2. To explore and suggest the solution for disaster warning, vulnerability and damage assessment, and communication technology for timely flow of information to the people.
3. To study the role of government Corporate Sector and NGOs in disaster management.

India is technically advanced and is connected by a network of agencies that record the impending disasters. Funds from every corner of the world are poured in places where such events happen be it in India or any other country. No doubt measures are being taken and there is awareness in the people & govt. too but no measures have proved so effective as to minimize the losses, which points to some lacuna either in observation, communication of message or execution of measures, and therefore it has become imperative to evolve a mode of management that can monitor all agencies at work for minimizing the financial and economic losses and hence the need for study. For the study so needed, two things are necessary:

1. Management agency empowered with all execution policies
2. Harmonizing policies, institutions, technologies and management structure at centre that may further be extended to states and local levels.

Institutional and Policy Framework of India

Disaster management in India has evolved from an activity-based structure to an institutionalized structure. from a single faculty area to a multi-stakeholder setup and from a relief-based approach to a multi-dimensional approach to risk mitigation. The beginnings of an institutional disaster management structure began in the British era after a series of disasters that hit the country. These were the famines of 1900, 1905, 1907, and 1943, and the Bihar-Nepal earthquake of 1937. Over the past century, the structure for managing disasters in India has undergone major changes in their composition, nature, and policies.

The basic responsibility for the implementation of rescue, relief and rehabilitation measures in the event of a disaster rests with the state government in question. The central government complements the efforts of state governments through logistical and financial support during severe natural disasters. Logistical support includes the use of aircraft, specialized equipment of the Armed Forces, Armed Forces of the State and National Disaster Response Force (NDRF), supply of materials and auxiliary supplies, including specialized medical stores, restoration of critical infrastructure, including the communications network and support that affected states may need to effectively manage the situation.

The British government adopted a reactive approach to disaster management and established emergency departments to provide emergency assistance during disasters. This was a configuration based on activities that only worked in disaster situations. The policy was aimed at relief. The activities that began in this configuration included the design of help codes and the initialization of the food-for-work programs. After independence, the task of disaster management continued to be with the assistant commissioners in each state, acting under the Central Auxiliary Commissioner. His role was limited to the delegation of aid material and money in the affected area. The frequent occurrence of floods and droughts in the country limited the extent of the disaster problem in India to the two hazards. Because both floods and droughts had a direct impact on the agricultural sector, disaster management in India has been linked to agriculture and related issues. Each five-year plan dealt with flood disasters as part of irrigation, development of command zones and flood control. Until then, the disaster management structure was work-oriented and operated under the Aid departments, so it was a single-faculty domain and was weighted only in terms of funding.

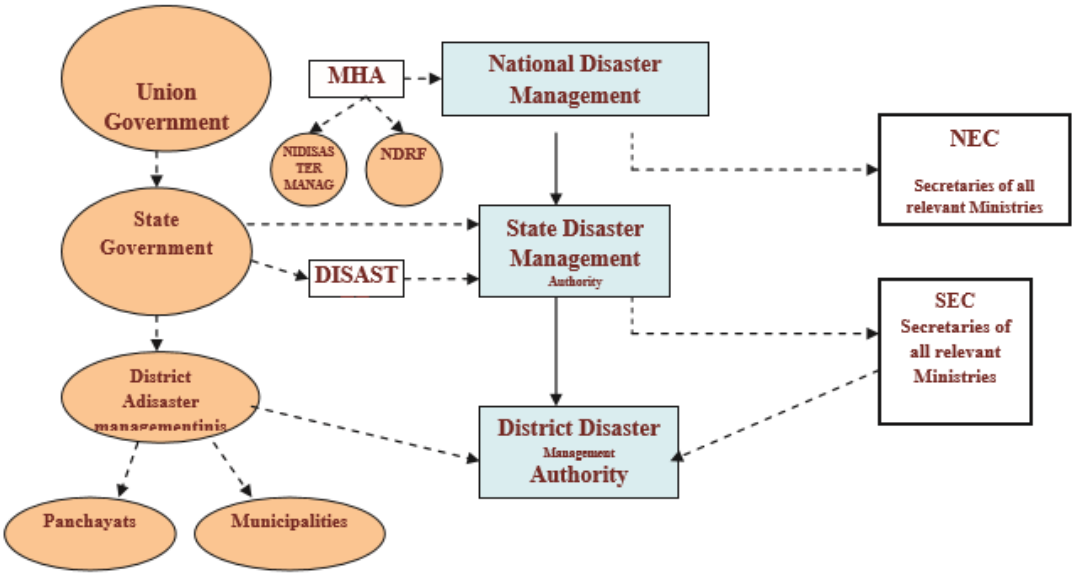


Fig 1

Comparison of measures associated to pre-disaster stages and post-disaster stages

Ex ante measures are those related to the phases prior to the disaster, such as preparation and prevention, and ex post measures refer to the post-disaster phases, such as rehabilitation and reconstruction. Ex ante measures to improve disaster preparedness are considered more cost-effective than ex-post measures. However, it is noted that resources are usually allocated after a catastrophic event, even in disaster-prone areas, rather than deployed before disasters, leading to an inadequate allocation. Providing more resources for the pre-disaster phases, such as preparedness and prevention, under ex-ante measures has the following benefits in Uttarakhand.

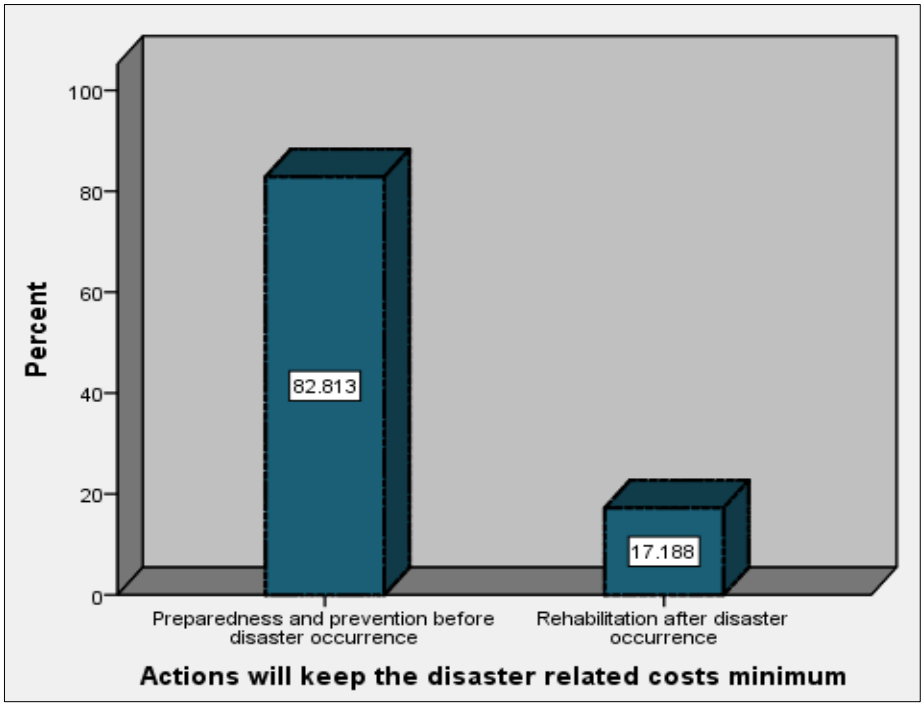
- Helps to reduce financial losses.
- Helps to reduce casualties.
- Effective for tourists.
- Effective response to an emergency situation.
- There will be a reduced problem of reconstruction and rehabilitation due to the increased competence.
- Basic services like communication can be restored very fast.
- Efforts can be concentrated on developmental activities in the state.
- The rise in the level of resiliency amongst citizens will go a long way in reducing the ill effects of current as well as future disasters.

Expenditure and investments for disaster management can be planned in a more meaningful and methodical manner rather than giving sudden shocks to the economy.

An opinion was taken from the sample of 512 respondents to know their opinion as to

Which out of the actions mentioned below will keep the disaster related costs at the minimum?

a. Preparedness and prevention before disaster occurrence
b. Rehabilitation after disaster occurrence



Source: Primary data

Fig 2

The examination revealed that 83% of the respondents feel that preparedness and prevention before disasters will keep the disaster related cost at the minimum in the state and 17% of the respondents feel that rehabilitation after disasters will keep the disaster related cost at the minimum.

Some observed climate trends in Uttarakhand

The maximum temperature of Uttarakhand District Pantnagar decreases continuously at a rate of 3 ° C / 100 years and the minimum temperature of Pantnagar continuously increases at a rate of 2.1 ° C / 100 years. This is representative of the Uttarakhand levels. This pattern at minimum and maximum temperatures is not very conducive to the growth and development of the plant, since an increase in night temperature will result in a greater loss of food material during respiration. In addition, there are certain crops, such as tomatoes, that produce more when the daily temperature range (difference between maximum and minimum temperatures) is large. The average temperature shows almost no trends (or decreases very slowly) with a large interannual variability.

The rainfall in Pantnagar increases at a rate of approximately 10 mm / year. This is due in large part to the few events of heavy rainfall in the recent past. Otherwise, the rain over the years is almost constant, with large annual fluctuations. A very alarming trend can be observed in bright sunshine hours that decrease at a rate of approximately 2 h / 100 years.

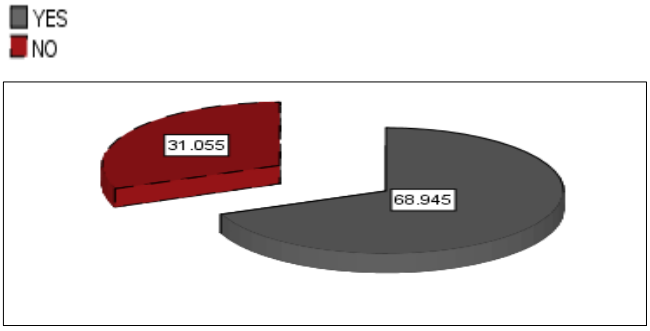
This can be detrimental to some crops, especially those that need more radiation. The hours of bright sunshine are decreasing due to the increase in cloud cover. The increase in cloud cover is also responsible for night-time heating and daytime cooling, as it reflects solar radiation in space during the day and delays long-wave radiation from the Earth, which does not allow night-time cooling. Climate are strongly influenced by local patterns of land use and different physiographic processes and therefore can vary widely from

one place to another. Trends in climatic parameters can also vary spatially. Therefore, the weather pattern of all seasons must be carefully analyzed to create a specific action plan for the site.

Recovery actions are locally focused

First, recovery planning must be controlled by the community. The NDRF highlights as one of its nine principles the concept and meaning of local leadership and local primacy. Local governments, businesses, NGOs and, especially, members of their community are the main responsible for many recovery, investment and action decisions. Therefore, local governments play the leading role in the planning and administration of many aspects of community reconstruction. The structure of the local recovery organization must have a direct link with the local government. A local contribution from state, tribal and federal partners is also required so that they can develop programs and policies that meet local needs. In some cases, it can be difficult for the community to assume significant responsibility in the recovery process due to deficiencies, resources, employees or other factors. External partners may need to support the planning, outreach, communication and implementation of the recovery activities. However, this support still needs to be channelled through community leaders, local governments and a wide range of community actors. Care must be taken to ensure that assistance is provided as needed, immediately after disasters and that cleaning decisions are still required.

An opinion was taken from the sample of 512 respondents to know that latest technology / tools / equipment's helps to minimize the impact of disasters and the result was as follows

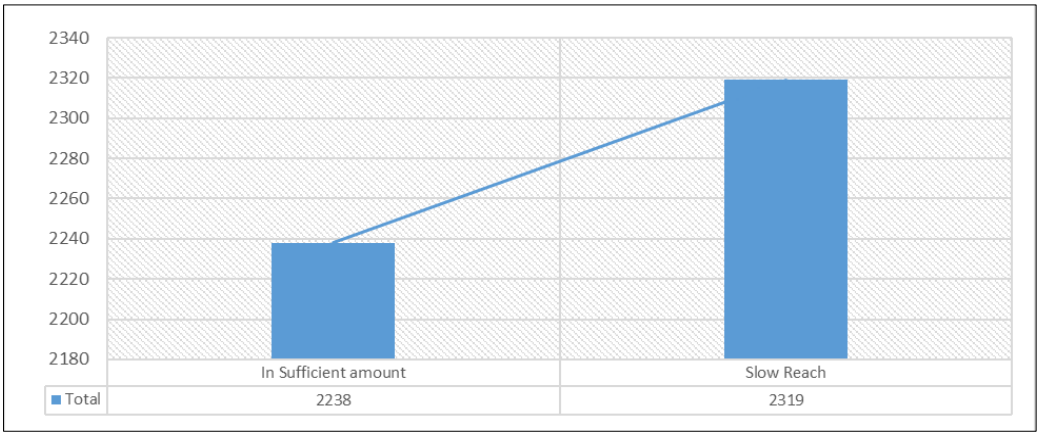


Source: Primary Data

Fig 3

The analysis shown that 69% of respondents believe that latest technology / tools / equipment's helps to minimize the impact of disasters in Uttarakhand and 31% of respondents consider that there is no such need. It is concluded that latest technology / tools / equipment's helps to minimize the impact of disasters min the state.

An opinion was taken from the sample of 512 respondents to know What is the issue with relief amount in the state by using rank scale method and the result was as follows



Source: Primary data

Fig 4

Sendai framework for disaster risk reduction 2015-2030

International efforts to reduce or mitigate the effects of disasters have increasingly focused on human vulnerabilities in the last 20 years. In 2000, the Millennium Declaration recognized the special risk of disasters and urged the world community to "intensify our joint efforts to reduce the number and impact of natural and man-made disasters" (United Nations 2000).

The Hyogo Framework for Action (UNISDR 2005) has developed risk and vulnerability indicator systems at national and subnational levels to enable decision makers to assess and address the impact of disasters on social, economic and environmental conditions, both public officials and public health. also the people in danger of extinction - the dangers. Progress has been made in strengthening disaster preparedness, response and early warning systems, but in most countries progress has been limited in addressing underlying risks such as poverty, environmental degradation, rapid urbanization. and the growth of the population in vulnerable areas.

The Sendai Framework was adopted in March 2015 at the third United Nations World Conference on Disaster Risk Reduction in Japan. It contains seven strategic objectives and 38 indicators to measure progress in disaster damage reduction. These indicators align the implementation of the Sendai Framework with the Sustainable Development Goals (SDG) of the United Nations and the Paris Climate Agreement.

The role of Science and Technology in Disaster Reduction

The Science and Technology Communities have expressed their desire to strengthen dialogue and cooperation with policy makers and DRR professionals at the local, national,

regional and international levels through voluntary commitments formulated for the Third UN World Conference on Levels of Disaster Reduction to identify the needs and gaps in knowledge, to co-design new knowledge, to co-produce and deliver together, and to make science more accessible. To achieve this, science and technology communities and networks will mobilize and strengthen existing capacities and initiatives to support the implementation of the post-2015 framework for disaster risk reduction from the local to the global level, and in particular the results in the following six areas:

- Assessment of the current state of data, scientific knowledge and technical availability on disaster risks and resilience (what is known, what is needed, what are the uncertainties, etc.);
- Synthesis of scientific evidence in a timely, accessible and policy-relevant manner;
- Scientific advice to decision-makers through close collaboration and dialogue to identify knowledge needs including at national and local levels, and review policy options based on scientific evidence; and
- Monitoring and review to ensure that new and up-to-date scientific information is used in data collection and monitoring progress towards disaster risk reduction and resilience building.

In addition, two cross-cutting capabilities need to be strengthened

- Communication and engagement among policy-makers, stakeholders in all sectors and in the science and technology domains themselves to ensure useful knowledge is identified and needs are met, and scientists are better equipped to provide evidence and advice;
- Capacity development to ensure that all countries can produce, have access to and effectively use scientific information.

Scientific data and information and the concrete application of technology are crucial for the development of well-informed policies and decisions in the public, private and voluntary sectors. There is a lot of scientific evidence, but better links are needed with policy and planning decisions to continually improve our ability to predict, reduce and respond to disaster risks, thus creating resilience.

Early warning domestic system

The CMDM will be the main focal point responsible for coordination of early warning, as well as the technical agencies and technical committees concerned, their dissemination and guarantee the dissemination of the last kilometer of the same. The DMMC State Emergency Operations Center will be inconsistent coordination with all technical agencies responsible for natural and man-made hazards, and in the event of an impending disaster, take steps to inform the officers responsible for future communication to -levels and communities.

- Establish coordination with local technical agencies responsible for predicting the different natural disasters.
- Establish a reliable communication system. Radio, television, newspapers and social media etc.
- Create awareness among communities and all stakeholders, including the police, about the communication system in use for early warning and what immediate action should be taken, especially in rapid-onset disasters.
- Alert and information system is very effective information system during the event of hazards
- Early warning system is mainly preparing for disaster and act accordingly to mitigate against or avoid it.

Uttarakhand action plan for climate change: Some observed climate trends in Uttarakhand

The maximum temperature of Uttarakhand District Pantnagar decreases continuously at a rate of 3 ° C / 100 years and the minimum temperature of Pantnagar continuously increases at a rate of 2.1 ° C / 100 years. This is representative of the Uttarakhand levels. This pattern at minimum and maximum temperatures is not very conducive to the growth and development of the plant, since an increase in night temperature will result in a greater loss of food material during respiration. In addition, there are certain crops, such as tomatoes, that produce more when the daily temperature range (difference between maximum and minimum temperatures) is large. The average temperature shows almost no trends (or decreases very slowly) with a large inter annual variability.

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Case study: The seismic alert system in mexico City: an example of a successful early warning system (EWS)

The time interval between the first observations of a seismic event to the point where damage, injury and death occur is crucial. This system uses a range of more than 100 sensors in southern Mexico to allow real-time measurements of seismic activity. This system has been used so far in a total of 34 public alerts and 72 preventive warnings out of a total of 2,200 detected earthquakes. It was used only once prematurely and this was during the development phase of the system. Implementable and communicated.

Although the EWS of Mexico City has achieved great technological and seismological advances, there are still lacking clear public policies and protocols to distribute and use the early warning message. The use of beepers and mobile phones to receive alarms is a relatively new technological option to improve the distribution of alarms. But who is authorized to issue warnings under what conditions is not regulated. This is particularly important in view of the fact that low-cost recipients are widely disseminated by local and federal governments, but have not been associated with a usage policy. For example, is it

possible to vacate a 20-story building within 50 seconds of the opportunity? What should hospitals do in 60 seconds? In summary, the SAT in Mexico City offers an unprecedented opportunity to save lives in a major earthquake.

Conclusion

On the basis of the analysis in chapter 5 with the help of SPSS tool, case studies and other secondary data, At the 5% level of significance there is enough to conclude that The government should invest more funds in tools / equipment's / technology for prediction of disasters (e.g. earthquake predicting instruments) as well as to minimize the impact of disasters. The state government is primarily responsible for the implementation of rescue, relief and rehabilitation measures in case of natural disasters. Sometimes, the efforts need to be reinforced and complemented with centralized assistance. The provision of grants for the preparation, restoration, reconstruction and mitigation of disasters during natural disasters is not part of the mandate of the National Disaster Response Fund. In the case of a major disaster, where the need for aid for assistance exceeds that available for the State Disaster Relief Fund, the national disaster assistance fund will receive additional central support according to the established procedure.

Scientific data and information and the concrete application of technology are crucial for the development of well-informed policies and decisions in the public, private and voluntary sectors. There is a lot of scientific evidence, but better links are needed with policy and planning decisions to continually improve our ability to predict, reduce and respond to disaster risks, thus creating resilience. I) Establish coordination with local technical agencies responsible for predicting the different natural disasters. ii) Establish a reliable communication system. Radio, television, newspapers and social media etc. iii) Create awareness among communities and all stakeholders, including the police, about the communication system in use for early warning and what immediate action should be taken, especially in rapid-onset disasters.

On the basis of current study some recommendations for natural disaster management to control financial losses due to natural disasters are drawn as follows

- State must identify a multiple source for issuing disaster information and warnings. This information should be circulated using all available means, including radio, television, newspapers and the Internet. The Government at all levels must have proactive policies to make available technologies and information exchange, including the Internet, satellite broadcasting and others.
- The first and most important is to restructure the National Disaster Management Policy that reflects the holistic approach that includes prevention, mitigation and preparedness in the pre-disaster phase with appropriate additional funding, as well as relief and post-disaster rehabilitation.
- There is an urgent need to sensitize decision makers, policy makers, administrators, professionals (architects, engineers and others at various levels) to financial institutions (banks, insurance companies, financial institutions) and NGOs and voluntary organizations.
- Preparation for the implementation of early warning is essential at the local and national levels should include all possible participants in the alert process. Regional institutions should provide technical assistance for the development and testing of such plans through the development of model plans.

First, a reliable valuation of the environmental impact of infrastructure projects is needed like tunnels, dams, roads, new tourist places, power house, mining and deforestation etc. in these highly environmentally sensitive areas of Uttarakhand in a scientific manner.

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