A Strategic Approach on Managing Climate Risks in the Himalayan Region

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Himalayan region is known for its natural beauty and pilgrims have been attracted to the region for many centuries. The physical characteristic of the himalayan region combined with tourism has induced climate change which has rendered the region highly vulnerable. This study aims at devising effective management strategies to asses risks and their impacts. Also, to implement Community-Based disaster risk management system and Finally, Networking and Advocate Policy Formulation Process Efforts to share information on climate change in order to promote coordination between governmental agencies and civil society organizations on climate research and practice of Climate Risk Management.

Keywords: Climate Change, Himalayas, Tourism

1. Introduction

Himalayan region's fragility stems from its susceptibility to multiple hazards of geological as well as hydro meteorological origin such as earthquakes, landslides, floods, flash floods, droughts, wildfires and cloudbursts. The physical and socio-economic characteristics of the Himalayan region combined with the changing risk factors such as environmental and climate change, population growth, and economic globalization have rendered the region highly vulnerable. Impacts of climate change and climate variability have been well observed in the Himalayas, in particular, with respect to recession of snowline, formation of glacial lakes, and changes in biodiversity in the ecosystems. There has also been an increase in the frequency as well as intensity of hydro-meteorological hazards in the region such as higher incidences of riverine floods and droughts, secondary hazards like landslides/slope failures, 'out of season' occurrences of concentrated rainfall, flash foods, and cloudbursts, prolonged drought, torrential rains, etc. Changes in the normal weather patterns, including shifting of seasons, and variations in temperatures, timing and periodicity of sunshine, rainfall, and snowfall, have also been observed. As a result there is loss of habitats, species extinction, depletion of pasture lands, diseases in wild animals, pest attacks, high turbidity in water bodies, and waterborne epidemics. All these environmental imbalances have resulted in economic losses which includes destruction of tourism and hospitality infrastructure that are crucial to tourism industry which discourage the tourists to visit Himalayan destinations.

On the other side, Tourism which is considered as one of the world's largest, fastest growing and most climate-dependent economic sector which plays a significant role in the economic and social development of many destinations and communities around the world. De Freitas (2001, p. 3) believes that "Thus far, much of the research specifically on climate and tourism, reported in the journal's literature have been superficial, in that relationships between climate and tourism are assumed rather than observed and seldom objectively tested". The findings of the study realized that climate change has already begun which will impact the life in the forthcoming decades, there is also a clear perception of responsibility from the stakeholders involves in destination management to support for renewable energy incentives and there is a call for responsible growth based on integrated destination management. Thus, there is dire need to devise effective management strategies to asses' risks and their impacts. Also, to implement Community-Based disaster risk management system and Finally, Networking and Advocate Policy Formulation Process Efforts to share information on climate change in order to promote coordination between governmental agencies and civil society organizations on climate research and practice of Climate Risk Management in order to protect our rich biodiversity and promote tourism on sustainable basis.

2. Vulnerability of Tourism to Climate Risks

Vulnerability refers to the extent to which a system may be (adversely) affected, disrupted or displaced by an external force. In this case, we are concerned with components of the tourism system and the challenges associated with climate change. The magnitude of the implications of climate change for tourism and recreation will depend upon both the distribution and importance of tourism phenomena and the characteristics of climate change. Other things being equal, locations whose economies are highly dependent on tourism appear to be at the greatest risk. As Himalayan region is pre-dominantly known for its tourism potential, so climate change is going to have everlasting impact on tourism in this region.

As we know, tourism is not evenly distributed and is highly localized in specific places, especially cities, coasts and mountains. Cities are often major tourism attractions but they usually have a diversified economy. It is often the less-populated areas which have a high dependence on tourism and many coastal and mountain locations specialize in catering to tourists. Both because of their relatively simple economic structure and the seasonality of their businesses, and because such areas are likely to experience many of the physical consequences of climate change, they may be more vulnerable. Much tourism and recreation is concentrated in high energy environments, such as mountains and coasts, and it is these areas which appear to be particularly vulnerable to

climate change through modifications in the hydrological cycle, particularly changes in water levels, stream flow and the magnitude and timing of snowfall. Elsewhere and writing in an international context, the author (Wall, 1992; 1993) has suggested that domestic travel patterns are likely to be more stable than international travel because the former often take place in relatively short periods of free time and time limitations place constraints on the destination choices of travelers.

Furthermore, destinations which rely primarily upon their natural resource base to attract visitors, such as mountains and coasts, are likely to be more at risk than those which depend upon cultural or historical attractions. One of the major attributes of most tourist destinations is seasonality. Not only is there a regular round of activities associated with the seasons, there is also variation in activity in areas lacking a marked seasonal climate. This is because seasonality in areas of demand results in seasonal variations in visitation to areas of supply. Smith (1990) has pointed out that vacation travel decisions are influenced by conditions at home as well as at potential holiday destinations and suggests that It should be remembered that the climatic and weather parameters which influence tourism, both singularly and in combination, vary from activity to activity. Although there is some information on the minimum climatic conditions necessary for particular activities to take place (Crowe, McKay and Baker, 1978) and suggestions have been made concerning the responses of participants in different activities to changes in the weather (Paul, 1972), more work in these areas is needed.

In addition to the relatively direct impacts of climate upon tourism which have been considered, climate also impinges upon recreation in a less direct fashion. Thus, for example, an abundance of snow may make the skiing conditions very good but the journey to the slopes impossible. Conversely, recent observations in Alberta indicated that, although snowfall was reduced, many skiers were attracted to the hills by the mild, sunny weather. On a longer time scale, climatic change will influence the distribution of vegetation types, wildlife and fish species on which some forms of tourism depend. Much tourism takes place on or near the shoreline and the presence of water enhances many forms of tourism even if water contact is not required. Fluctuations in climate at meso and macro scales have implications for water levels and discharge, and influence amenity and property values. Thus, the above discussion indicates the far-reaching consequences of weather and climate for Tourism as it is extremely difficult to generalize concerning the possible implications of climate change for tourism. It is difficult to think of almost any area of land or water which, with or without human modification or management, does not have potential to provide some recreation opportunities. At the same time, the range of tourism activities is extremely large and they have varied environmental requirements.

Finally, Climate-induced events have impacted the lives, assets, and livelihoods of the mountain communities of Himalayan region, especially traditional livelihood options like agriculture and animal husbandry. Decreased productivity of existing crops and the resultant changes in cropping patterns have commonly been observed in the region, such as diminishing quality and productivity of apples in the lower reaches of the valleys. Changes in habitat caused by climate change induced disasters such as floods and droughts as well as changes in food supply are leading to decreased production of milk and meat from livestock. Also reported are loss of habitats, species extinction, depletion of pasture lands, diseases in wild animals, pest attacks, high turbidity in water bodies, and waterborne epidemics. In addition to the direct impact on crops and livestock, events such as landslides and floods result in economic losses due to disruption of transportation linkages with markets, leading to sharp rise in the prices of essential goods and food. Greater intensity and frequency of climate-induced events also discourage tourists, and destroy natural resources and hospitality infrastructure that are crucial to tourism industry.

3. Review of Literature

Review of literature indicates that most of the glaciers in the Himalayas have been shrinking at accelerated rates in recent decades. As a result of rapid melting of glaciers, glacial runoff and frequency of Glacial Lake Outburst Floods (GLOF) causing mudflows and avalanches have increased (Bhadra, 2002; WWF, 2005). The variation in temperature shows an increasing trend in the northwestern Himalaya (Bhutiyani *et al.*, 2007) and the upper Indus Basin covering the Hindu Kush Mountains (Fowler and Archer, 2006). Analysis of temperature series by various researchers showed that the main portion of the Himalayan region has experienced statistically significant warming since the mid-1950s, especially in winter. The linear rates of temperature increase over the Tibetan region during the period 1955 to 1996 are about 0.16 °C/decade for the annual mean and 0.32 °C/decade for the winter mean, exceeding those for the rest of the Northern Hemisphere at the same latitudinal zones in the same period. Wu *et al.* (2007) reported an averaged trend for the increase in annual near surface air temperature on the Tibetan Plateau of 0.02 °C/year during 1971–2000.

McSweeney *et al.* (2008) reported that the average number of hot nights per year has increased by nine, while the average number of cold days decreased by 19 (5.2 percent of days in the year); the average number of cold nights per year decreased by 32 (8.7 percent of nights in the year) between 1960 and 2003. Results of analysis of daily temperature data for the 36 years from 1971 to 2006 by Baidya *et al.* (2008) showed an increasing trend of relatively higher magnitude in mountainous regions compared with the *terai* belt, which may be associated with the occurrence of prolonged fog in the *terai* region. However, Agrawal and Perrin (2009: 356-357) note that "Adaptation strategies are viewed by some scholars as being prospective in nature in contrast to coping efforts which are seen as being retrospective and in response to specific experiences of variability.

UNEP and UNWTO aim to bring efforts on climate change and tourism into their mainstream environment activities, building on the Davos Declaration (UNWTO 2007a) and demanding action to adapt tourist businesses and destinations to climate change and to mitigate the impacts of tourism on climate change. In addition it builds on the Bali Strategic Plan to enhance the provision by UNEP of capacity building assistance to developing countries and countries with economies in transition (UNEP 2005) as well as broader concerns over the need for global institutional leadership with respect to tourism-related climate change adaptation and mitigation activities, as expressed in the Helsingborg Statement on Sustainable Tourism (Gössling et al. 2008a).

Today, planners have the opportunity and obligation to develop a Strategic Approach on Managing Climate Risks in the Himalayan Region. The planning profession and the process of planning are uniquely suited to help communities rise to this historic challenge. Success will require new policies and a bold new approach to planning, including the recognition that there will be enormous challenges to our political and economic institutions to address the myriad impacts of climate change (APA, 2011). Previous research has attempted to develop and map quantitative measures of the climatic well being of tourists (e.g. Mieczowski's Tourism Climatic Index). These have been based on the assumption that a majority of tourists are entirely motivated by climatic conditions, of a certain and common nature (Limb & Spellman, 2001). Mintel (1991) claimed that 73 percent of respondents to a UK survey cited 'good weather' as the main reason to go abroad. This study develops the idea that tourist decisions related to trips within the UK by UK residents has a far more sophisticated relationship with climatic conditions and these cannot be adequately captured by simple quantitative indices.

De Freitas (2001) asserts that weather in different tourism destination vary from favorable to unfavorable range. He refers to climate which can be measured and considered as an economic benefit for tourism. He believes that there are several problems while measuring the climate, "one major problem is selection of meteorological or climatological criteria. For example, what exactly are the criteria for ideal, suitable, acceptable, or unacceptable conditions? Only after appropriate climatological criteria have been clearly identified can key questions be answered. When is the best time to visit? What clothing equipment is needed? What are the weather hazards or climate extremes likely to be? (p. 5). Also, Becken (2010) believes that climate and weather are fundamental factors in tourists' decision making process in their pre-trip behavior. She also refers to another importance of climate for a better operation in tourism industry. She added "more specifically, climate is defined as the prevailing condition observed as a long term average in a location. In contrast, weather is the manifestation of climate at a specific point in time and place (p. 2). Thus, we can conclude that Climate change is a priority issue in the programme of work of UNWTO and within the special area on Sustainable Development of Tourism. UNWTO is actively working on raising awareness on climate change issues in the tourism sector and on integrating tourism into UN and other international policy processes on climate change. The WMO collects and assesses information on the world's weather, climate and water resources and related environmental issues, and aims to predict these for societal benefit, including mitigating the impacts of natural disasters on climate-sensitive socio-economic sectors such as tourism. Also, Good science based on credible, salient, legitimate knowledge can often lead to good policies in the context of climate change and mountain specificities, and vice versa (Thompson and Gyawali, 2007).

4. Strategic Approach on Managing Climate Risks

Mountain communities have been practicing risk mitigation and climate change adaptation measures traditionally. Many communities have adopted coping mechanisms such as changes in cropping patterns/agricultural practices, crop diversification, and changes in sowing and harvesting time of crops to less disaster prone seasons. Communities often depend on social networks than on government assistance to deal with crisis situations. However, rapid urbanization, population increase, uncontrolled development, sustained poverty, inadequately protected infrastructure, deforestation, and environmental degradation from various anthropogenic activities accentuate the vulnerabilities of mountain communities to the impacts of climate change/variability. Remote terrain and scattered nature of settlements impair community's access to health and educational facilities, communication infrastructure, response mechanisms, and external assistance in the aftermath of a disaster.

In the changing climatic scenario, communities need information, awareness, and proper training is required to cope with disasters. The adoption of preparedness and mitigation measures is of utmost importance to minimize the impacts of climate change/variability. This requires effective strategies at various levels that build on traditional coping mechanisms of mountain communities, and identify culturally acceptable, locally viable, and sustainable measures which includes

a. **Policy, Advocacy and Awareness Building** – Interactions with the communities have shown that the people in the himalayan region appear to be more aware, sensitive and receptive to the need to adopt risk reduction measures/steps. It was found that the receptivity among the younger generation was comparatively lower and also there is need to undertake concerted and pointed awareness generation campaigns/ activities at community level. The community awareness raising must be complemented by a sustained policy and advocacy effort aimed at policy and decision-makers at national and regional level, and also at the local administrative functionaries as well as other stakeholders.

b. **Undertake Easy-to-Implement, Low Cost Risk Mitigation Activities** – Implementing feasible, easy-to-implement and low cost risk mitigation measures with involvement of communities will help promote risk mitigation at local level. The risk mitigation measures at local level must be the ones which can be feasible with little external assistance or with minimal outside support. This will help sustainability of risk mitigation among communities. These can be in the form of 'informal' embankments or creation of natural barriers like plantations, boulders, spurs etc. for protection of precious assets. Linking plantation initiatives to socio economic needs will ensure greater ownership among people. At the same time, it has been observed that plantations need to be undertaken after careful assessment of local topography so that they do not become a barrier and obstruct flow of water. Feasible risk reduction measures can also be factored into the local development programmes.

c. **Preparedness and Contingency Planning** – Efforts to facilitate community contingency planning and enhancing preparedness can contribute towards risk mitigation. The process can involve participatory community hazard and risk identification, resource mapping, identification of evacuation routes, safe shelters, stock-piling of essential commodities and

other response measures. The efforts for preparedness and contingency planning undertaken with identified communities on a pilot basis have shown that communities feel more capacitated and confident of managing and responding to an event. However, disaster management and preparedness planning process must be anchored with local administrative units or elected bodies/representatives at village/community level to ensure greater synergies with administrative response mechanisms. This will also ensure requisite administrative support to communities to sustain the process.

d. **Training and Capacity Building** – Programmes to build capacity of local administrative officials and communities in contingency planning including first responder trainings especially search and rescue, first aid etc. need to be undertaken. Tough mountain terrain and lack of multiple access routes make it imperative for creating capacities at local level for immediate response to optimize external assistance. Initiatives in this regard have been implemented with organization of trainings on first medical response and search and rescue. A strong focus on training women as disaster managers has been imparted due to peculiar social fabric among mountain communities as majority of the men folk find employment away from their villages/families and women virtually act as head of the family/ community. The knowledge to protect people from climate induced hazards must be disseminated in an easy-to-relate manner and capacity enhancement at local administrative level needs to be initiated. Involvement of national and/or regional training institutions and their expertise can also be harnessed for fine-tuning the training programmes.

e. **Design and Implement Easy-to-Maintain and Operate EWS** – In order to address the current limitations in existing EWS, there is a felt need to ensure existing EWS are given greater community orientation. Currently, a major gap in monitoring and timely dissemination of actionable warnings has been observed. At Regional Glacial Lakes Outburst Floods (GLOF) Risk Reduction Initiative in the Himalayas, multiple monitoring and warning dissemination systems remain operational with little or no coordination or sharing of data. Guidelines to promote better understanding of and response to warnings generated at community level need to be developed. In view of short response time in the event of a glacial lake outburst flood, speedier warning dissemination must be ensured through focus on 'last mile connectivity'. Protocols to facilitate greater coordination between technical/ monitoring agencies and civil administration can help overcome the challenges posed by scattered communities and valleys as well as mountain-shadow areas in devising effective warning dissemination mechanisms. The need is to devise and implement an easy-to-operate and maintain EWS which can be managed by the communities themselves.

f. **Concepts and Practices Related to Land Use Management** – Introduction of concepts and practices related to land use planning and management at community and local administration level can help prevent location of high value individual or community assets in hazard prone areas. It is critical in safeguarding socio-economic assets and development projects which constitute the mainstays of economies. Efforts have been made to address some of the aspects related to land use management under the project. However, due to short implementation period, an exhaustive process could not be undertaken as the lead for the process needs to be taken by the administration. However, sensitization of communities to avoid location of their individual assets away from hazard prone areas has received greater acceptability. This will also help integrate the risks posed by Climate change into the development planning process especially in vulnerable areas.

g. **Hazard and Risk Assessments** – Detailed hazard and risk assessments and risk quantification must be conducted to feed into the development planning process, especially with regard to location of vital community, development and social infrastructure. These assessments must be communicated at community level in an easy-to-understand manner. Conducting the assessments in tandem with the local administration can help promote their use in local development planning process. The assessments can act as valuable inputs for devising appropriate risk mitigation and preparedness measures.

h. **Regional Coordination** – The delicate cause and effect relationship between hazards and risks in the Himalayan region and trans-boundary impacts necessitate closer bi-lateral and regional coordination necessitates closer coordination. Mechanisms facilitated by institutions like SAARC Disaster Management Centre should be used to implement a multi-stakeholder and multi-sectoral approach to address these hazards. Coordinated strategies can be devised by harnessing the knowledge generated by technical/research agencies to formulate an actionable agenda for implementing organizations like NGOs/INGOs etc. Greater information sharing needs to be facilitated between countries sharing the Himalayan ecosystem to learn from and feed into each others' work.

i. **Knowledge Networking** – Impact of climate change and climate variability presents newer challenges. The need is to ensure 'melting of knowledge domains' by facilitating greater information sharing through platforms/mechanisms for the same. The knowledge or technical inputs generated by one institution can be used to inform further action by another. The shifting hazard, risk and vulnerability profiles need to be studied and assessed to generate suitable risk reduction, mitigation and preparedness strategies.

j. **Harmonizing Risk Mitigation and Natural Resource Management** – Afforestation and natural and water resource management need to be incorporated in risk mitigation strategies to protect the Himalayan ecosystem. The likely changes in the hydrological cycle can be offset by promoting effective natural resource management and by converting the challenge

posed by a vast water body into an opportunity. Recognizing that mountain communities are more intimately connected to the natural resources, integrating natural resource management elements with risk reduction approaches can help ownership and sustainability and promote a greater 'buy-in' from people.

k. **Adopting an Integrated Climate Risk Management Approach** – Hazard specific knowledge must feed into an integrated approach, highlighting the need to address all climate induced hazards in an integrated manner by developing strategies cutting across geographical and time scales, sectors and stakeholders. Communities in mountain areas are susceptible to multiple hydro-meteorological or climate induced hazards. Building community resilience would require a more integrated approach addressing multiple hazards in a comprehensive manner instead of a hazard specific one. Policy instruments/frameworks should be formulated at national, local and regional level to adopt an integrated climate risk management approach addressing all climate induced hazards. The sociological interventions help build community resilience while complementing the ongoing structural risk mitigation initiatives.

Finally, strategic approach on the impact of Climate risks should involve community interactions and knowledge sharing in the region promoted through online discussions, national consultation workshops, community based sensitization and first responder trainings. Risk mitigation and preparedness planning exercises at the community level must be undertaken to strengthen community based initiatives. These activities are to be conducted in consultation with the local administration, with involvement of elected representatives and community based institutions. The outreach of print and television media has also been harnessed for sensitizing the communities, administrations and other stakeholders. Also, efforts should be made to address all climate induced hazards in an integrated manner as the impact on the communities, probable risk mitigation, preparedness and response mechanisms overlap. Cost benefit analysis of prevention vis-à-vis relief and recovery must be conducted. Greater collaboration with technical agencies for synergies of action and an all-stakeholder approach must be adopted and different sectors should also be involved in the process.

Policy Matrix to Cope up Himalayan Uncertainty

	Scientific uncertainty	Adaptation	Mitigation
State	Regional cooperation, support long-term research, engage in research processes	Inter-sectoral collaboration, support for poverty alleviation and environmental conservation	Commitment to international treaties, developing good policies
Market	Partnership in research, new hardware and software for monitoring	New technology, support for community development and local education	Self-regulating and reducing greenhouse gas emissions
Civil society	Participatory vulnerability analysis, linking local to global, facilitating knowledge learning	Community preparedness, facilitating local learning and adaptation	Social auditing, green watch, and monitoring
Local community	Local indicators and monitoring, local knowledge, innovations, and practices	Improved land/resource management, preparedness for surprises	Renewable energy, alternative livelihoods, and migration
ICIMOD's role	Impact assessment, knowledge synthesis, regional database, forecasting, monitoring	Capacity building, support for mountain policies, pilot demonstration, optimising land-use patterns and livelihoods in mountain 'niches'	Facilitating the clean development mechanism (CDM) and carbon market place, designing payments for environmental services

5. Summary & Conclusion

Recognizing the lack of studies and basic data, we speak of uncertainty on a Himalayan scale. In no context is this more relevant than in predicting what climate change will entail. The physical manifestations of climate change in the mountains include locally, possibly regionally, extreme increases in temperature and in the frequency and duration of extreme events. It seems certain that there will be appreciable changes in the volume and/or timing of river flows and other freshwater sources. There is, however, great uncertainty about the rate, and even the direction, of these changes, because so little is known about the dynamics of Himalayan topo-climates and hydrological processes, and their response to changing climatic inputs. The global circulation models used to model climates capture global warming on a broad scale, but do not have adequate predictive power for even large Himalayan drainage basins. To reduce uncertainty, we need well-equipped baseline stations, long-term monitoring, networking, open data exchange, and cooperation between all Himalayan countries.

The Himalayan region contains one of the most dynamic and complex mountain systems in the world. This mountain system is extremely vulnerable to global warming (Bandyopadhyay and Gyawali, 1994). Uncertainties about the rate and magnitude of climate change and potential impacts prevail, but there is no question that climate change is gradually and powerfully changing the ecological and socioeconomic landscape in the Himalayan region, particularly in relation to water. Business as usual is not an option. It is imperative for environmental decision makers and managers to revisit and redesign research agendas, development

policies, and management and conservation practices, and develop appropriate technologies. The mitigation of carbon emissions should be a responsibility shared between citizens and the private sector in the mountains, as elsewhere. Adaptation and mitigation measures intended to cope with climate change can create opportunities as well as offset the dangers of a warming planet; but they must be identified and adopted ahead of, rather than in reaction to, dangerous trends. Policies should be 'adaptation friendly'.

The impacts of climate change are real and its trends appear to be uncertain. To cope with climate catastrophe, a well thought-out strategy for adaptation is warranted. Information is critical for adaptation, particularly for rural households in the Himalayan region. Bottom-up approach is an appropriate and effective method to provide information and to increase awareness among the people at the grassroots level about climate change and its implications. The social security and disaster management mechanisms in the fragile ecosystem are not so strong to meet the challenges posed by climate change. The raw climate information has to be translated to quantitative terms, and uncertainties should be stated in probabilistic terms for effective decision making for rural households. Therefore, correct information and effective way of its dissemination are crucial for coping with climate change, particularly for vulnerable households who are the hardest hit by natural calamities.

Finally, Adaptation is the need for managing Climate risks in the Himalayan region. Himalayan farmers and herders have a long history of adapting to these uncertainties, to other related and unrelated environmental changes, and to ecological surprises, whether through mobility of people and land uses, or flexibility in livelihood strategies and institutional arrangements. Mountain people have lived with and survived great hazards such as flash floods, avalanches, and droughts for millennia. Building on this capacity to adapt and strengthening the socio-ecological system in the face of climate change is extremely important and an important step in achieving sustainable livelihoods. Climate change, as a public and global issue, has evolved from a narrow interest in the hydro-meteorological sciences, to a broad recognition that both the social consequences and policies of the human response to climate change have implications for all aspects of human development. Adaptive policies and major efforts to reverse the human drivers of climate change have to be incorporated into all sectors: land use, water management, disaster management, energy consumption, and human health. Hazard mapping would help both decision-makers and local communities understand the current situation, thereby enabling them to anticipate or assess their flexibility to adapt to future changes through proper planning and technical design.

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