Consolidated Reply
Query: Disaster Risk Reduction in the Hindu Kush Himalayas-Experiences.

Compiled by G Padmanabhan, Ramesh Jalan and Mamta Katwal, Resource Persons and Nupur Gupta and Jai Gaurav, Research Associates
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From Krishna S. Vatsa, Bureau of Crises Prevention and Recovery-UNDP, New Delhi
Posted 16 November 2010

The Regional Climate Risk Reduction Project (RCRRP), supported by European Commission’s Humanitarian Aid Office (ECHO) and implemented by UNDP’s Bureau for Crisis Prevention and Recovery (BCPR) through respective UNDP Country Offices in Bhutan, India, Nepal and Pakistan, aims to develop and implement climate risk management strategies to reduce the risks faced by mountain communities and to mitigate impacts of hydro-meteorological hazards. The geographical coverage of the project spans selected communities across four countries in the Hindu Kush Himalayan region, viz. Bhutan, India, Nepal and Pakistan.

With a view to understand and assess the whole gamut of issues related to climate-induced risks and their impacts, practitioners from the fields of disaster management, climate change, environment management, development planning, NGOs, community-based organizations, local
representative institutions, technical agencies and research/academic institutions are invited to share their knowledge, experiences and observations on the subject through an e-discussion.

We request members to respond to the following:

- How has Climate change/Climate variability led to increase in frequency and intensity of disasters in the Hindu Kush Himalayas and how it has affected livelihoods?
- What has been the response from the communities and government institutions to reduce the risks of such variability/disasters? Have these strategies changed over time?
- To what extent communities depend upon government assistance and social networks to deal with crisis situations?

In addition members may kindly share case studies, documents and related literature relevant to the above areas.

The experience and knowledge generated through the implementation of pilot initiatives under the RCRRP would contribute towards establishing a sustainable model to link climate change adaptation and DRR measures at the community level. The technical inputs, knowledge resources, experiences and learning shared would be compiled with due acknowledgement in the form of a report. The process will culminate into an exhaustive knowledge bank on inter-related issues.

The e-discussion shall be guest moderated by UNDP-BCPR Team in New Delhi. The Moderators' Team requests all practitioners from the fields of DRR, CCA, environment management, natural resource management, development planning, civil society, technical, research and academic institutions to share their valuable insights and expertise on the issues.

The information and experience shared will contribute towards building a knowledge base to inform and feed into the programmatic interventions in this regard. We look forward to your inputs, comments, experiences and learning on the subject.

Responses were received, with thanks, from

1. **Suman K Apparusu**, Independent Consultant, Hyderabad
2. **Archita Bhatta**, The Energy and Research Institute, New Delhi
3. **Subhadra Channa**, Department of Anthropology, Delhi University, New Delhi
4. **Suman K Apparusu2**, xxx, xxx
5. **Archana Vaidya**, Independent Consultant, New Delhi
6. **P. C. Joshi**, Society for Indian Medical Anthropology, Department of Anthropology, Delhi University, Delhi
7. **Aika Singh**, AMRITA (Agency For Multidimensional Research, Implementation, Training & Advocacy), Uttar Pradesh and Bihar
8. **Arvind Kumar Sinha**, Regional Climate Risk Reduction Project, UNDP-BCPR South & South, West Asia, New Delhi
9. **Mohinder Slariya**, Environmental Sociologist, Chamba, Himachal Pradesh
10. **Rashmi Gangwar**, Centre for Environment Education, Lucknow
11. **Syed Arsalan Zaidi**, UNESCO, Pakistan
12. **Saamdu Chetri**, PMO, Thimphu
13. **Vimal Khawas**, Sikkim University, Gangtok, Sikkim
14. **Amber Masud**, United Nations Development Programme, Pakistan
15. **Sanaullah Khan**, United Nations Development Programme, Pakistan
16. **Amit Tuteja**, SEEDS India, New Delhi
17. **Usman Qazi**, Pakistan
The ecologically fragile Hindu Kush Himalayan (HKH) region has historically been prone to geological as well as climate-induced hazards. There has been an increase in the frequency as well as intensity of hydro-meteorological hazards in the region such as: higher instances of riverine floods, droughts and secondary hazards like landslides/slope failures; greater number of Glacial Lake Outburst Floods (GLOF); ‘out of season’ occurrences of concentrated rainfall, flash floods and cloud bursts, prolonged drought, torrential rains etc. Changes in the normal weather pattern, including shifting of seasons, variations in temperatures, timing and periodicity of sunshine, rainfall, snowfall etc. have also been observed.

Research by the Pakistan Meteorological Department based on a long-term climate data, reveals that the region which receives almost 65% of total monsoon rains in Pakistan has shifted 80-100 km from the northeast towards northwest regions (consisting of Khyber Pakhtoonkhwa and northwest Punjab). The increase in size and volume of glacial lakes and formation of new lakes have made HKH region more prone to GLOFs, particularly in Nepal and Bhutan. Also reported are loss of habitat, species extinction, depletion of pasture land, diseases in wild animals, pest attack, high turbidity in water bodies and water born epidemics.

In the recent past, there have been several episodes of cloudbursts ravaging villages in many states of India in this region. The recent flood in Pakistan that impacted over 10% of Pakistan’s total population was the outcome of an unprecedented magnitude of monsoon rains in the northwestern province of Khyber-Pakhtunkhwa (KP).

The climate-induced events have impacted the lives, assets and livelihoods of the mountain communities of HKH region, especially on traditional livelihood options like agriculture and animal husbandry. Decreased productivity of existing crops and resulting challenges to changes in cropping patterns have commonly been observed in the region, for example diminishing quality and productivity of apples in the lower reaches of the valleys of Kulu and Kinnaur districts of Himachal Pradesh, India. Changes in habitat caused by climate change induced disasters such as floods, droughts and changes in food supply are leading to decreased production of milk and meat from livestock.

In addition to the direct impact on crops and livestock, events such as landslides, floods etc., result in economic losses due to disruption of transportation linkages with markets leading to
sharp rise in prices of essential goods and food. Greater intensity and frequency of climate-induced events also discourage tourists, destroys natural resources and hospitality infrastructure that are crucial to tourism industry.

Mountain communities have been practicing risk mitigation and climate change adaptation measures traditionally. Many communities have adopted coping mechanisms to deal with these changes such as: changes in cropping patterns/agricultural practices, crop diversification, changes in sowing and harvesting time of crops to less disaster prone time periods etc.

Shifting from cereal crops to fruit trees has been observed in many places like Himachal Pradesh, India. In certain cases such mechanisms pose additional demands on communities in terms of labor and other resources and even expose them to newer risks. 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.

Communities often depend on social networks than on government assistance to deal with crisis situations. Strengthening of social networks is an urgent necessity to help people in crisis situations. This would require understanding different informal and undocumented safety nets based on mutual understanding for dealing with adverse situations.

In the changing climatic scenario communities need information, awareness and proper training to cope with disasters. In earthquake affected districts of Baramulla and Kupwara in Jammu and Kashmir, an NGO is undertaking a DRR and Climate Change awareness campaign in 700 schools. Rural peasants’ informal coping mechanisms in the form of the adjustments or introduction of new varieties or practices should be reinforced by creating strong linkages between the research and extension wings of the state apparatus. In some cases conservation committees for preserving natural forest and pasture management for CBDRM (Community Based Disaster Risk Management) have been instituted, and natural resource management related structural mitigation practices adopted to minimize the potential of hydro-metrological hazards.

There is a dearth of systematic research/studies that scientifically validate the impacts of climate change/variability on the communities and establish direct linkages between climate change/variability and increasing disaster frequency/intensity of hydro-met hazards in the region. Pioneering work in the Hindu Kush Himalayan region is being carried out by the International Centre for Integrated Mountain Development (ICIMOD), Hindu Kush-Karakoram-Himalaya (HKKH) Partnership for Ecosystem Management, Food and Agriculture Organization (FAO), Mountain Partnerships’ Mountain Product Program etc.

Local Communities have been more concerned about anthropogenic environmental change due to deforestation, mono-culture aorestation programmes and damaging developmental practices. The significant challenge therefore is to communicate and understand such adverse changes and its impacts on the day to day lives of the people.

The adoption of preparedness and mitigation measures is of utmost importance to minimize the impacts of climate change. This requires effective strategies from the governments at various levels that builds on traditional coping mechanisms of mountain communities, identifies culturally acceptable, locally viable and sustainable alternatives. Effective disaster response requires decentralized mechanisms to help the communities during emergencies (including community based Early Warning System).

In Pakistan, the Ministry of Environment is working on climate change policies. Realizing the importance of DRR and climate change adaptation, most of the non-governmental sector in the
country is also in the process of integrating DRR and climate change in their programmes. The Government of India has come up with the National Action Plan on Climate Change, which lays down priorities and future actions on a number of areas related to both mitigation and adaptation.

The construction of climate adaptive and environmental friendly houses in Leh for the flash flood affected families, incorporating thermal and environmental features to ensure safety from future flash floods and cold, initiatives including setting up Mobile Health Clinics and imparting training to the local construction workers was undertaken by SEEDS in collaboration with LEDeG (Ladakh Ecological Development Group). Strengthening capacities of NGOs to address climate change threats and adaptation strategies and forming extensive networks will add to the government initiatives in this direction and facilitate institutional strengthening.

A strong policy framework for Himalayan region to mitigate short term as well as long term impact of climate-induced hazards based on sustained cooperation between the Himalayan countries centered on environmental protection where Himalayan people are part of the policy making process for the region is the need of the hour.

Comparative Experiences

Himachal Pradesh

Local Community responds to diminishing Apple crops, Himachal Pradesh (from Archana Vaidya, Independent Consultant, New Delhi)
In the lower regions of Kullu valley, Climate change led increase in frequency and intensity of disasters has resulted in diminishing Apple crops. The local community has responded to this by growing other fruits and vegetables. The size of the land holding of most of the farmers and apple growers in the area is very small thus their resources are limited which does prove to be an impediment for them to diversify. The government agricultural scientists engaged in research and extension work in the area have also started recognizing the climate change, or at least an increased variability of weather in the area.

Reviving lost livelihood due to changes in weather pattern (from Arvind Kumar Sinha, Regional Climate Risk Reduction Project, UNDP-BCPR South & South, West Asia, New Delhi)
Kinnuar district is known as cold desert which due to heavy snow throughout the year had adverse poverty twenty year ago. A local farmer brought some of the plants of apple from another similar location to this area and it was found very useful in terms of quality as well as productivity. It spread all over the valley and now Kinnaur apple is known as one of the best apples in the country. The Communities of the region have selling on an average 20 million apples per village per year.

Jammu and Kashmir

Activity Based Participatory Teaching and Learning, Baramulla and Kupwara Districts (from Rashmi Gangwar, CEE Himalaya, Lucknow)
In earthquake affected districts of Baramulla and Kupwara, the Center for Environmental Education (CEE) Himalaya is undertaking a DRR and Climate Change awareness campaign in 700 primary, middle and high schools. Its is a blend of some interactive teaching on the disasters followed by hands on activities, practical experiments, demonstrations and games thus creating overall awareness about climate change and individual actions to mitigate its impacts.

Pakistan
Gilgit-Baltistan Disaster Management Authority, Gilgit-Baltistan region (From Babar Khan, WWF-P Northern Areas, Pakistan)
In the Gilgit-Baltistan region of Pakistan loss of habitat, species extinction, increased frequency and intensity of melting of glaciers, high turbidity in water bodies etc were clear evidence of climate change and their sectoral impacts. Gilgit-Baltistan Disaster Management Authority (GBDMA) authority is a newly established department working for its institutional strengthening to improve their capacity and management skills.

Role of Local Government Authorities in DRR, (From Rabia Khattak, United Nations Development Programs, Pakistan)
Establishment of District Disaster Management Authorities (DDMAs) under the National Disaster Management Ordinance (NDMO) of 2006 has taken place. DDMAs are taking a lead in identification of hazard and assessment of risks and are producing the information in the form of comprehensive district disaster risk management plans in consultation with key stakeholders.

Related Resources

Recommended Documentation

From Archita Bhatta, TERI, New Delhi
Glacial Lakes and Associated Floods in the Hindu Kush Himalayas
Information Sheet; by Pradeep Mool, Rajendra Shrestha and Jack D. Ives; International Centre for Integrated Mountain Development (ICIMOD); March 2010
Available at: http://www.preventionweb.net/files/13255_icimodglaciallakesandassociatedflood.pdf
(PDF, Size: 355 KB)
Reports on the process of climate warming and its impact on glaciers and the development of potential glacial lakes within the Hindu Kush Himalaya region

Analysis of Variability and Trends of Extreme Rainfall Events over India using 104 Years of Gridded Daily Rainfall Data
Study; by M. Rajeevan, Jyoti Bhave, A. K. Jaswal; Geophysical Research Letters, Vol. 35; 20 September 2008
Examination of rainfall data, variability & long-term trends of extreme rainfall shows increasing trend of extreme rainfall events over last 50 years could be associated with climate change

From Suman K. Apparusu, Independent, Hyderabad
Norwegian in Himalayan Climate Impacts
Report; Himalayan Climate Impact Assessment (HICIA) Project
Findings from the HICIA pilot study on GLOFs, water resources, climate and hydrological models, data availability and accessibility in the Hindu Kush Himalayas region

Benefitting from Earth Observation: Bridging the Data Gap for Adaptation to Climate Change in the Hindu-Kush Himalayan Region
Presentation; Mountain GeoPortal and International Centre for Integrated Mountain Development (ICIMOD)
Available at: http://geoportal.icimod.org/symposium2010/Papers.aspx
Symposium aimed to promote regional cooperation and synergize efforts for improved scientific knowledge and understanding for adaptation to climate change in the Himalaya.
Cooling the Earth: Tactics for Restoring Climate Order and Saving the Planet
Document type; publisher; date
Available at: ftp://ftp.solutionexchange.net.in/cr/res16111001.pdf (PDF, Size: 98 KB)
Document contains information on the disaster risk reduction profile in the Hindu Kush Himalayas region, which could be used to develop appropriate climate risk strategies for the region

Hyogo Framework for Action 2005-2015: Building the resilience of nations and communities to disasters (HFA)
(from Rabia Khattak, United Nations Development Programme, Pakistan
Available at http://www.unisdr.org/eng/hfa/hfa.htm (PDF, Size: 405 KB)
Advocates mainstreaming DRR into socio-economic development and recommends integrating environmental and natural resource management within risk reduction

From Amit Tuteja, SEEDS India, New Delhi
The Weeping Apple Tree Film; Vijay Jodha; 2005
Available at: http://www.youtube.com/watch?v=Xc8yXYXZarY
Illustrates the complex issue of climate change by focusing on the shifting apple growing belt in Himachal Pradesh

Contribution of Working Groups I, II and III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC)
Report; by Pachauri, R. K. and Reisinger, A. (Eds.); Intergovernmental Panel on Climate Change, Geneva, Switzerland; 2008
States climate variability & melting glaciers in Himalayas are increasing risks of natural disasters in hilly settlements, making the HKH region more prone to GLOF, particularly in Bhutan & Nepal

Climate Change and India: A 4x4 Assessment A Sectoral and Regional Analysis for 2030s
Report; INCCA: India Network for Climate Change Assessment; Ministry of Environment & Forests, Government of India; New Delhi; November 2010
Available at http://moef.nic.in/downloads/public-information/fin-rpt-incca.pdf (PDF, Size: 12 MB)
Assessment of impact of climate change in agriculture, water, natural ecosystems & biodiversity and health in Himalayan region, the Western Ghats, the Coastal Area and the Northeast region

Annual Report 2009-10
Report; Ministry of Environment & Forests, Government of India; New Delhi; 2010
Available at http://envfor.nic.in/report/report.html
Recommended for its report on climate change effects on biodiversity and livelihoods.

Formation of Glacial Lakes in the Hindu Kush-Himalayas and GLOF Risk Assessment (Madhavi Malalgoda Ariyabandu, UN International Strategy for Disaster Reduction for Asia & the Pacific (UNISDR), Bangkok)
Report; UNISDR-AP; Global Facility for Disaster Reduction and Recovery (GFDRR) and (ICIMOD); 2010
Available at: [http://www.unisdr.org/preventionweb/files/14048_ICIMODGLOF.pdf](http://www.unisdr.org/preventionweb/files/14048_ICIMODGLOF.pdf) (PDF, size: 3.08MB)

Provides the methodology for mapping glacial lakes and information for building regional collaboration to reduce glacial lakes hazards in the HKH region

**Recommended Portals and Information Bases**

**Disaster Risk Reduction-Selected Publications (1985-2008)** (from [Suman K. Apparusu](http://www.unisdr.org/preventionweb/files/14048_ICIMODGLOF.pdf), Independent, Hyderabad)


Selected publications on DRR, disaster preparedness for natural hazards and impact of climate change in the Hindu Kush Himalayas region

**Centre for Environment Education** (from [Rashmi Gangwar](http://www.unisdr.org/preventionweb/files/14048_ICIMODGLOF.pdf), Centre for Environment Education, Lucknow)


Recommended for the directory on NGOs addressing climate change issues in the Indian Himalayan Region (IHR)

**Recommended Organizations and Programmes**

From [Suman K. Apparusu](http://www.unisdr.org/preventionweb/files/14048_ICIMODGLOF.pdf), Independent, Hyderabad

**International Centre for Integrated Mountain Development (ICIMOD), Nepal**
P.B. 3226, Khumaltar, Kathmandu, Nepal; Tel: +977-1-5003222; Fax: +977-1-5003299; info@icimod.org; [http://www.icimod.org/](http://www.icimod.org/)

Serves the eight regional member countries (including India and Bhutan) in the Hindu Kush Himalayas to help them understand the affect of climate change on fragile mountain ecosystems

**National Disaster Management Authority (NDMA), New Delhi, India**
NDMA Bhawan, A-1, Safdarjung Enclave, New Delhi 110029; Tel: 011-26701700; [www.ndma.gov.in](http://www.ndma.gov.in)

Apex body mandated to lay down policies, plans and guidelines for disaster management and also provides support to other countries affected by major disasters

From [Saamdu Chetri](http://www.unisdr.org/preventionweb/files/14048_ICIMODGLOF.pdf), Prime Minister’s Office, Thimphu

**Department of Disaster Management (DDM), Ministry of Home and Cultural Affairs (MoHCA), Royal Government of Bhutan, Bhutan**
P.B. 133, Tashichho Dzong, Thimphu, Bhutan; Tel: +975-2-322301; Fax: +975-2-335905; [http://www.mohca.gov.bt/?mode=DEPT&var=21](http://www.mohca.gov.bt/?mode=DEPT&var=21)

Promotes supports and facilitates disaster management to create happy and safe Bhutan through the reduction of disaster risks

**National Environment Commissions (NEC), Bhutan**
P.B. 466, Thimphu, Bhutan; Tel: +975-2-323384; Fax: +975-2-323385; [http://nec.gov.bt/index.htm](http://nec.gov.bt/index.htm)

Agency mandated to look after environmental issues, coordination of inter-sectoral programmes and implementation of policies and legislation for sustainable development

**Ministry of Agriculture and Forests (MoAF), Royal Government of Bhutan, Bhutan**
P.B 252, Thimphu, Bhutan; Tel: +975-2-323765; Fax: +975-2-324520;
Recommended for its efforts in agriculture and forests related to DRR and adaptation to climate change, such as managing protected areas in mountain areas, natural resource management etc.

United Nations Development Programme (UNDP), Bhutan
P.B. 162, UN House; Thimphu, Bhutan; Tel: +975-2-322424; Fax: +975-2-322657; http://www.undp.org.bt/environment.htm
Implementing environment and sustainable development programmes, recommended for its work on Bhutan related to DRR and adaptation to climate change

Royal Society for Protection of Nature (RSPN), Bhutan (from Mamta Katwal, Resource Person)
P.B. 325, Thimphu, Bhutan; Tel: +975-2-322056; Fax: +975-2-323189; rspn@rspnbhutan.org
Civil society organization involved in sustainable livelihoods, environmental education, ecological research and community based natural resource management

Rashmi Gangwar, CEE Himalaya, Lucknow

Centre for Environment Education Himalaya (CEE), Ahmedabad
Thaltej Tekra, Ahmedabad 380054 Gujarat; Tel: 91-79-26858002; Fax: 91-79-26858010; ceehimalaya@ceeindia.org; http://www.ceeindia.org/; Contact: Dr. Avdesh Gangwar, Programme Director, Himalaya, Centre for Environment Education (CEE)
Strengthens environmental education towards sustainable development and disaster preparedness in the mountain ecosystems of the Indian Himalayan region

From Amit Tuteja, SEEDS India, New Delhi

Govind Ballabh (GB) Pant Institute of Himalayan Environment and Development
Kosi-Katarmal, Almora-263 643, Uttarakhand, India; Tel: 91-5962-41015; Fax: 91-5962-31360; http://envfor.nic.in/gbpihed/; e-Mail: gbpihed@rediffmail.com
Focal agency to advance scientific knowledge, to evolve integrated management strategies and to ensure environmentally sound development in the entire Indian Himalayan Region (IHR).

Hemwati Nandan Bahugunana Garhwal University Department of Geology, India
Srinagar (Garhwal) 246174, Uttarakhand, India; http://hnbgu.ac.in/index.php?option=com_content&view=article&id=259&Itemid=247
Research institute devoted to climate change research work and variability in the Himalayas

Livelihood & Forestry Programme (LFP), Nepal
P.O. Box 106, Kathmandu, Nepal, Tel: (+977 1) 4410010; Fax: (+977 1) 4410469; Email: lfp@lfp.org.np; URL: www.lfp.org.np
Promotes equitable, efficient and sustainable use of forests by rural communities, addresses climate change through mitigation and adaptation strategies

Sustainable Environment & Ecological Development Society, New Delhi
15/A First Floor, Institutional Area, Sector-1V, R.K. Puram,New Delhi, India ; Tel: 91-11-26174272,26174572;Fax: 91-11-26174572 www.seedsindia.org;
SEEDS is a non-profit voluntary organization working to make vulnerable communities resilient to disasters; imparted training and constructed environment friendly houses in Ladakh
Promotes awareness raising activities, establishment of national platforms in DRR and enhances networking and partnership building for safety of all communities in AP region.

Indian Meteorological Department, Ministry of Earth Sciences, Government of India, India
Mausam Bhavan, Lodi Road, New Delhi 110003, India; http://www.imd.gov.in/; Contact: Mr. Kamal Singh, Publication Section at Tel: 91-11-4382-403
Reports on climate variability and subsequent increase in frequency and intensity of disasters.

National Food Security Mission, Ministry of Agriculture, Government of India
Department of Agriculture and Cooperation, Ministry of Agriculture, Krishi Bhawan, New Delhi, 110001, India; http://nfsm.gov.in/Default.aspx; Contact: Mukesh Khullar, Join Secretary at Tel: 011-23381176; khullar.m@nic.in
Assists to address climate change adaptation at the national level.

National Rainfed Area Authority (NRAA), Ministry of Agriculture, Government of India, India
NASC Complex, Dev Prakesh Shastri Marg, PUSA, New Delhi 110012, India; Tel: +91-11-25842836, Fax: +91-11-25842837; http://nraa.gov.in/areaoffocus.aspx
Assists to address climate change adaptation at the national level as part of Government initiative to climate change and DRR.

Wadia Institute of Himalayan Geology, India
33 GMS Road, Dehradun, 248001, Uttarakhand, India: Tel: +91-0135-2525-103; Fax: 0135-2625212; director@wihg.res.in; http://www.wihg.res.in/geom_div.html
Devoted to studying landforms and their evolution in the Himalayas in conjunction with geodynamic processes, climate changes, including glacial dynamics and their implications.

Pakistan Meteorological Department, Government of Pakistan, Pakistan (from Syed Arsalan Zaidi, UNESCO, Pakistan)
Headquarter Office Sector H-8/2, Islamabad; Tel: +92-51-92503601; Fax: +92-51-9250368; pakmet_islamabad@yahoo.com; http://www.pakmet.com.pk/rnd/rndweb/index2.htm
Recommended for research work on climate change and subsequent increase in disasters and how climate variability would make certain areas in Pakistan vulnerable to floods.

Recommended Communities and Networks

National Alliance for Adaptation and Disaster Risk Reduction (NAADRR), India (from Amit Tuteja, SEEDS India, New Delhi)
NADRR Secretariat, C/o SEEDS, 15 A, DMA Building, Sector 4, R. K. Puram, New Delhi -110063, India; Tel.: +91- 11- 26174572 / 4272; http://www.nadrrindia.org/; E-mail: info@nadrrindia.org
Connects individuals and agencies in integration of DRR for a more community based initiative. Afghanistan and Nepal are its associate members.

Related Consolidated Replies
Developing a Training Module for Disaster Risk Reduction and Climate Change, from Sarat Panda, UNDP, Thimphu (Advice; Experiences). Solution Exchange Bhutan; Issued 26 May 2010
Available at: http://www.solutionexchange-un.net.bt/cr/cr-se-bhutan-26051002.pdf (PDF, Size: 143 KB)

Offers inputs for a training module on disaster risk reduction and climate change adaptation through natural resource management

Developing a PPP Framework for Climate Change Adaptations and DRR Efforts - Advice; Examples from Tanvi Patel, Centre for Integrated Development, Ahmedabad, Gujarat
Climate Change and Disaster Management Community
Available at: ftp://ftp.solutionexchange.net.in/public/clmt/cr/cr-se-clmt-drm-27071001.pdf (PDF; Size: 147 KB)

Elaborates on possible frameworks that could be effectively used in order to include public/private partnerships in climate change adaptation and DRR

Developing Climate Responsive Approaches to Managing Disaster Risk from Amit Tuteja, SEEDS, New Delhi for Alliance for Adaptation and Disaster Risk Reduction
Disaster Management and Climate Change Community

Shares experiences of adaptation to Climate Change and Disaster Risk Reduction Programmes, and identifies key challenges faced in implementing such adaptation programmes

Responses in Full

Suman K Apparusu, Independent Consultant, Hyderabad
This is a timely and interesting post. My observations on the questions posed in the query are as follows:
• Climate Variability/Change Impact: The overwhelming scientific and community call has been for more and accurate climate variability data for the region. Pioneering work in the Hindu Kush Himalayan region is carried out mostly by the International Centre for Integrated Mountain Development (ICIMOD) through some of their flagship initiatives namely - transboundary biodiversity management initiative, regional rangeland program, Kailash sacred landscape conservation initiative, ABS regional framework. Other noteworthy initiatives in the region include the Hindu Kush-Karakoram-Himalaya (HKKH) Partnership for Ecosystem Management, Food and Agriculture Organization Mountain Partnerships' Mountain Product Program and the Shimla Declaration at the CM's conclave in Dec 2009.
• Institutional Support and Communities Response: The region is more in need of a pro-active adaptive social protection data and implementation framework considering the sparseness and accuracy of data along the CC, DRR and Development Axes.

Archita Bhatta, The Energy and Research Institute, New Delhi
Please refer to my response to the specific questions asked.
• How has Climate change/ Climate variability led to increase in frequency and intensity of disasters in the Hindu Kush Himalayas and how it has affected livelihoods?
Studies have shown that intense rainfall has increased all over India and this has been directly related to the rise in sea surface temperature. Such intense rainfall events are also affecting Hindu Kush Himalayas. Besides this, peak flow in Himalayan rivers have increased leading to higher instance of floods in these rivers. Thinning of glaciers have led to increase in number of glacial lakes. As a result Glacial lake outburst floods have increased in frequency specially in the last 50 years resulting in loss of life and property.

Such disasters have affected livelihood in this region which is mainly dependent on agriculture and tourism. Crops have been destroyed by intense rain, rotten up during floods and washed away by GLOF. Since the probability of disasters has increased, tourists are already shying away from these areas. Every such incident destroys a lot of tourism infrastructure, and has a long term negative impact on the livelihood of the people. Besides, tourism in these areas is mainly based on the existence of natural resources like flowers, lakes, trees and scenic beauty in general. These natural resources having been affected by such disasters, tourism will be permanently affected in the long run.

I am providing some links to reports which show how climate change has led to increased frequency and intensity of disasters in general and in this region in particular.

http://www.preventionweb.net/files/13255_icimodglaciallakesandassociatedfloo.pdf


- What has been the response from the communities and government institutions to reduce the risks of such variability/disasters? Have these strategies changed over time?

Communities have reacted by designing long term adaptation strategies to cope up with such disasters. They have changed cropping patterns, shifting to crops that are less affected by intense rainfall and low scale floods. Shifting from cereal crops to fruit trees have been observed in many places like Himachal Pradesh. One of the reasons behind this is that such fruit trees are more tolerant to intense rain than cereal crops. Some have also changed the sowing and harvesting time of crops to time periods in which there is less risk of such disasters. In case of tourism they are trying to install infrastructure resilient to floods and rain and market their changed climatic situations to the tourists.

The Government is also helping villagers in these initiatives. Saplings of fruit trees have been made readily available and people have been trained to grow these trees and reap the best harvest from them. Training has also been imparted to identify good quality of fruit trees, pruning trees, planting them, protecting them from pests and help has been extended to reach the fruits to the market. Extension of road networks have gone a long way in aiding the villagers' access to the market

- To what extent communities depend upon government assistance and social networks to deal with crisis situations?

Communities depend more on social networks than on government assistance to deal with such crisis situations. The first call of help at the time of occurrence of the disaster is to the social network-- friends and relatives in the village and in the neighboring villages. Nevertheless government has come in to provide monetary and logistic help to salvage such situations.
Strengthening of social networks is an urgent necessity to help people deal with such situations. However, there are some sections of such societies who remain neglected in such networks because they are considered to be at a lower level in the social category. The government should pay special attention to help such people emerge from the devastation caused by such disasters.

Subhadra Channa, Department of Anthropology, Delhi University, New Delhi

I would like to share my experience of the Kinnaur region in Himachal Pradesh where a large dam is being constructed by a private hydro power company by drilling tunnels through the mountains. My visit to the high altitude villages at Rakcham, Chitkul etc. showed that large tracts of earlier fertile fields have been converted to wastelands by the huge boulders that have come crashing down the mountain because of the disturbances created by the high magnitude drilling operations. Fields are wasted and the people cultivating them have been left without any means of livelihood. People are well aware of the disaster caused by dam building and even the local gods are averse to such environmental destruction. The local people also feel that soon they will be demographically overpowered by the people coming from plains who are working as the engineers, technicians and office bearers of the hydropower company. The locals had a flourishing and self sufficient economy based on their local resources and environmental knowledge.

For a long time Himachal has had electricity in all villages from small local dams. They also used local small scale hydro power for activities such as grinding wheat. They do not see any rationale or local use of the huge dam project and feel that it is causing destruction of their livelihood and environment.

Earlier the people had many routes for trade and travel over the glaciers but now—because of the melting of the glaciers, deforestation and environmental destruction that has happened in the region they had to abandon these routes. People are facing hardships because they are travelling longer distance over routes that are different from their traditional short cuts across the mountains. This change of routes has affected their marriage and family relationships also.

There is also great fear of mountain floods as the glaciers are melting at a fast pace.

The people feel that they have been completely left out of the planning process. The big dam is seen as their worst enemy. People have been protesting against the proposed creation of Skiing slopes on the high mountains that they feel will be a large scale environmental disaster. As the people are being pushed out of traditional modes of livelihood they are turning to tourism and hotel building as alternative occupation and causing further damage to the environment.

The major culprit here is unplanned and environmentally insensitive development that is keeping only the interests of a few in mind.

Suman K Apparusu, Independent Consultant, Hyderabad

The following list of links may prove useful as a start point to map the DRR profile of the HKH region and evolve appropriate climate risk strategies for the region.

Archana Vaidya, Independent Consultant, New Delhi

In the past also I have contributed about diminishing apple crop in the lower regions of Kullu valley in Himachal Pradesh. That case study was also an example of about how Climate change/Climate variability led to increase in frequency and intensity of disasters in the Hindu Kush Himalayas and how it has affected livelihoods. Following are the facts of the case study.

Kullu Valley is drained by the Beas river and is approximately 60 km in length. The altitude in the valley varies from 3,500 ft at the valley floor to the upper limit of around 10,000 ft. Apple was introduced in the valley by English settlers in 1865. In the 1960s & 70s, the valley underwent a transformation from subsistence agriculture to commercial horticulture particularly in apple production. This is historically one of the largest apple growing belts in India

Bajaura is located in the lower part of the valley where good quality apples that fetched competitive prices were produced until 10 to 15 years ago. The farmers/horticulturist in this area are heavily dependent on apple crop. Red Delicious and Royal Delicious are two main commercial varieties of apple grown in this region and they are colloquially called ‘female’ apples. The ‘Male’ varieties including Golden Delicious are grown for cross-pollination (‘pollinators’). However in the last 10-15 years the apple belt is moving up in the valley and this lower altitude belt has seen almost complete failure of apple crop.

Apple is a very climatic sensitive crop and any change in the normal weather pattern affects blossoming, pollination and thus the fruit yield. Intensity, timing and periodicity of sunshine, rainfall, snowfall and number of chilling hours determine the fate of the crop.

The fruit quality, its colour and size depends upon sunshine received in the month of April and rain received after the fruit is set. Rainfall during pollination period i.e. during April washes pollen away from plants. Rain is required immediately after setting of fruit for the size to increase. Early snow is good for pollination and fruit-bearing conditions. It is more long lasting and resistant to melting than the late snow as it replenishes soil moisture and prevents the buildup of humidity in late March and early April. Amount of snow also determines the number of chilling hours which in turn affects time of bud-break. A chilling requirement averaging 10 week below 5°C is required to meet the internal conditions necessary for bud-break with the onset of spring temperatures. Frost in early spring has significant influence on the quality and quantity of apples.

Over the last 15 years the winter months have shifted forward. There is lack of early cold in December and January which adversely affect the chilling requirements and thus bud breaking. Incidence of late snowfall in February and March occurs mostly as a mixture of sleet and rain, resulting in lower temperatures and thereby a late onset of spring. Late cold in April can delay blossoming and reduce the pollination activity of bees as low temperatures due to late snowfall immobilizes the bees thus affecting cross pollination and apple fruit bearing. Late snowfall also fails to replenish the soil moisture to the desired degree. Rainfall Intensity has been mainly
unchanged however the period of rainfall has shifted towards late August and there is significant rainfall in the month of March and April. Temperature distribution has also undergone a significant change in addition to overall increased temperature. The periodicity of temperature is believed to be influenced by the timing of snowfall. There has also been witnessed an increase in frequency of extreme weather phenomenon such as cloudbursts, floods and hailstorms.

There was an early general perception among the farmers in the area linking changed climatic conditions to crop failure. The government agricultural scientists engaged in research and extension work in the area have started recognizing the climate change, or at least an increased variability of weather in the area.

Another very interesting study in this valley itself could be the increased incidents of very heavy out of season rainfalls, flash floods and cloud bursts. I presently have no data concerning this but would be very happy to share it once I have compiled it.

What has been the response from the communities and government institutions to reduce the risks of such variability/disasters? Have these strategies changed over time?

The communities have responded by diversifying in to growing other fruits and in to growing vegetables. The size of the land holding of most of the farmers and apple growers in the area is very small thus their resources are limited which does prove to be an impediment for them to diversify.

I am not aware of any government institutional intervention to help farmers of the area deal with the changed climatic conditions and increased climatic variability.

P. C. Joshi, Society for Indian Medical Anthropology, Department of Anthropology
Delhi University, Delhi

The mountain communities, especially in Indian context have been primarily concerned with the anthropogenic environmental change resulting due to deforestation, monoculturation of forest wealth, and damaging developmental practices. The consequences of climate change/climate variability as such has not been a dominating concern of the mountain communities till now but due to concerns expressed outside, the communities are becoming conscious of the adverse consequences. Thus compared to environmental degradation, the climate change discourse is not much talked about. The main reason for this is the fact that while mountain communities could directly relate environmental damages to landsides, soil erosion, watershed alterations, there is no way they could link any such observation to climate change/climate variability. But it is a reality that the mountain communities are facing the adverse consequences of climate change/climate variability. The main challenge therefore is to communicate and understand such adverse changes and relate them to the community life. The changes arising due to climate change can possibly locate at two levels: the scientific community and the people. When we make meticulous observations on temperature rise, melting of glaciers, GIS mapping and examine climate change, we are stating the facts but people may not be a party to this.

On the other hand, change in the rain fall, decrease in the agri-horticulture production, change in morbidity and so on would be the changes observed by the people. Both the aspects are intimately related but the links are not clearly stated. Thus, it is very important that links between what climate change is and how it is impacting the day to day lives of the people needs to be examined and effectively communicated. Although, the causative factors in bringing in the deteriorating climate change are largely the actions undertaken by the state machinery, but people through their small scale microscopic activities have also being contributing to this
phenomenon. It is therefore needed that we identify those activities which increase the burden of climate change. As most of these activities are intimately connected to livelihoods of the people we cannot put an end to these. Instead, what is needed is to identify culturally acceptable, locally viable and sustainable alternatives so that the mountain communities are easily able to accept them. As climate change has the capacity to be global and transcendental, the mountain communities which are generally low capital communities would require financial and material support to initiate and sustain an effective climate change agenda. Finally, it must be acknowledged that the mountain climate system is very sensitive and mountain eco-system very fragile. Thus, even a minuscule change in such system can create havoc on earth and therefore for saving the plains we must first save our mountains.

Alka Singh, AMRITA (Agency For Multidimensional Research, Implementation, Training & Advocacy), Uttar Pradesh and Bihar

I am very delighted that such an important issues have been raised, for which I am very thankful to the member.

The entire Hindukush-Himalaya reason is prone to the geological or climatically induced hazards of various forms and nature. However, there is a clear indication that not only the frequency of such hazards is increasing with time but also their intensity and impact on the lives and livelihood of people, living in the area, is increasing in severity. This year, we witnessed the incidences of cloudburst, flash floods in Leh, Shimla, Haridwar, Almora, Uttarkashi and Badrinath etc. Floods in Pakistan was also the part of the same climatic inductions. However, these were few of the nationally reported incidents but there were numerous incidences, which were not reported. Many hazards were caused due to the geological disturbances. However, such disturbance intensifies the nature of hazards when they cause massive amount of water or rock to collapse on the human settlements and their resources. Leh was the worst example of water-induced hazard. Himachal, Uttarakhand, and Jammu were also affected by hydrological hazards. In Himachal, there were several incidences of cloudburst, floods and landslide, recorded this year. The Flood of river Vyas was at the alarming point causing even a bigger threat of climatically induced hazard.

Here, I would like to share my experiences about Uttarakhand and Himachal Pradesh, especially in the context of recent water and climatically induced hazards. Both the states are very sensitive to earthquake, landslide and flash flood. As reports suggested that the Hindukush-Himalaya is very much prone to natural disasters but for last 3 to 5 years the entire Himalayan belt is facing acute hydrological and geological threat with increased frequency and intensity. Several types of disasters are being seen very frequently in recent years that were not so common in the region in the past years:

- Huge land slides
- Flood(floods has very different nature)
- dam outburst floods,
- cloud burst and floods
- Glacial Lake Outburst Floods,

A closer look into pervious century indicates towards the fact that frequency of geological disasters, like landslide, are increasing. Incidences like MALPA where entire village had gone vanished within a night with all pilgrims, were not very common in past. However, not only the frequency of geologically and climatically induced disasters have increased in Hindukush-Himalayan region with the time, but also their severity has been increased. Recent incidences, like one in Almora district where entire village was destroyed due to cloudburst, pointed towards the similar findings. There are more than ten major incidences of similar nature were recorded in Uttarakhand, Himachal Pradesh and J&K during this years. 2010 has not only witnessed
incidences like cloud burst, landslides at higher regions but also noted heavy rainfall in both upper and downstream regions. A vast region of Haryana, Punjab, Delhi, and UP witnessed heavy rail fall and flood. The intensity of these incidences were very high. Communities, especially, people who live on mountains are still facing the impact of these hazards. Again, responses towards these incidences are poor although the intensity of the challenges is increasing. Government machineries and the State do not have any effective strategy regarding preparedness and mitigation of the impact.

These incidences impact the lives and livelihood of the community, especially those who live on mountainous regain. First and foremost is the fact that incidences like landslide, cloud burst, and flood completely destroy traditional livelihood options like agricultural, farming and animal husbandry. Agriculture in this area forms only a portion of the household economy due to low production and lack of appropriate agricultural land and unfavorable factors. However, people have sustained their lives with a balance in agriculture, animal husbandry and migration. This years heavy rainfall and hazards impacted every facet of their economic lives. Secondly, these incidences destroy whatever means of communication existed in the area. We have witnessed that road transportation was completely destroyed due to heavy rainfall in Uttarakhand. With the destruction of road transportation essential supplies were also not been sent to villages and towns. Prices of green vegetables, serials and other essential goods skyrocketed during the period of disaster and even many weeks after that. Again, tourism and out-migration form the major portion of the economy of entire region. Badrinath Yatra (Chardhan Yatra) form the core of tourism in Garhwal region. However, this Yatra was closed within a few days after it started, due to heavy rainfall and destruction of roads. Thousands of family which were depended on their income on this Yatra suffered heavy losses this year, with no alternative income to support their families, especially when the prices were gone up due to hazards and road damages.

Ironically, Uttarakhand government made no time to request a demand of for Twenty one thousand crore rupee as the central assistance to mitigate the impact of the disaster in state. However the fact is that state government has yet not developed any effective strategy to counter the disasters and their impact. Giving the fact that such incidences are only going to be increased in future with greater potential to damage the state infrastructure, livelihood and lives government is still approaching towards them with stereotyped vision. Most demoralizing is the fact that Instead of developing a short term and long term strategy to counter the impact of such disasters, at policy level, government seemed to look them as an opportunities to fetch more money from the center.

Last month, India TV flashed a clip of Glacial Lake Outburst Flood in Garhwal region of Uttarakhand. The clip was not only dangerous but also forced us to think for the future action. The most dangerous part of the year was the fear created due to collapse of major dams like Bhakhara Nangal and Tihri. Especially, water in Tihari dam crossed the danger level and made us think about the potential destruction in the case of its collapse. UP has also witnessed the roaring form of river ‘Ramganga’ and entire area including cities like Bijnaour, Moradabad and Bulandshahar witnessed the worst experiences of flood. However, the worst this which was reflected in the case of Tehri dam that it showed that government did not have any concrete strategy to counter such a situation.

However, we do not have any national policy to protect Himalayas and its environment. Our policy makers never developed a Himalaya friendly policy to develop Himalayan ecosystem. Our governments are in hurry to replicate the model of plains in the entire Himalayan region. That was not very suitable for the Himalayas as well. As we know that Himalaya is a sensitive zone and contains large areas which is covered by glaciers, seasonal and perennial snows, wetlands (including lakes), quagmire, and peat. Subsequently, it is very necessary to make a sensitive policy to save Himalaya and to make this entire region safe for community and for the life of the
entire sub continent. It is also essential to understand the need of entire environment of Himalaya. However, central's approached towards issues associated with Himalaya with stereotyped models of creating states, with a notion that smaller states would take care of their developmental issues. But if we could dig into the reality then we would find that environment of Himalyan region is actually stressed under the needs of sustaining the state machinery rather than empowering the community. Revenue needs have necessitated both the state governments to formulate and practice anti-environmental policies, which is reflected in the presence of JPs, Ambuja's and other similar industrial groups in the areas. Although, there are environment related policies and safeguards existed in both the states however when it comes to practice then anyone can see that worst examples of destroying the mountains and its environment is being practiced at ground level. Mountains are being blown up with blasts (for cement production, stones and contraction) with poor technologies right from Shimla to Kinnaure and even one can see the worst situation in Shillai mining area in district Sirmaur. There is no one to save the Himalayan environment at the ground level. Kinnaure witness hundreds of incidences of avalanches each year however if you enter into the district you would witness that dynamites being used by JP group for blowing the mountain, on regular basis, causing the internal weakening of the rocks and reasons for future hazards. Why is this all happening? The answer is very clear state needs revenue from industries and from other states which purchase electricity. However the major portion of this revenue is spent on running and sustaining the state machinery rather than running the schemes of employment to the members of communities in hilly areas. There is an immediate need to stop all such activities which are causing damages to the mountains. There should be a national consensus on these issues. Again, there should be a long term policy framework for Himalayan states with protecting the environment at the center of it. Other policies of the states including industrial policy should be formulated with putting the environment at the center. At the cost of environment, there wouldn't be a good and sustainable economy.

The most negative aspect of our long term policy is that:

- The policy maker were never interested to develop a model for Himalayas
- They were hurry to replicate the plains model in the entire Himalaya zone
- The model of stereotyped urbanization damaged the whole eco system of the region.
- Himalayan friendly system is highly ignored by the authorities.
- The traditional safe system is replaced by the endangered system
- local people are not the part the policy making processes in the Himalaya
- lacking researches and studies on various aspects related to Himanlayan region.

Himalayan community is highly vulnerable to the disasters due to fact that any rescue or support operation requires much time and resources to reach to them, especially in the remote areas. Nevertheless, in changing scenario people are much feared about the new faces of disasters. They are trying to understand the reasons behind the new types of disasters. They are familiar with the past trend of the disasters like earthquake, land slide and floods, which has been normal part of their lives. However, in the changing climatic scenario community needs information, awareness and proper training to cope with disasters and also for adaptation. Ground reality is that:

- Government agencies have no system to know about any incident which takes place in remote areas.
- Government agencies are very less informed agencies at local level. There is lack of coordination among various agencies.
- People working with the agencies responsible to respond in emergency situation are working with stereotyped mindset. They do not respond quickly. They also lack the skills and trainings to respond efficiently during emergencies.
- Official information system is also very poor.
- There is huge gap between government official’s action and community requirement.
It is very necessary for the Himalayan region:

- To develop a Himalayan friendly policy process to fight with disasters and also to reduce it
- To develop a understanding between community and government people to make some local understanding
- Also to develop a Capacity Building for Flash Floods Management and Sustainable Development in the Himalayas.
- Himalayan people must be the part of the policy process for the region.
- Policy must be in the favor of the Himalayan environment and people
- To conduct researches and studies, on the regular basis, to contribute in risk reduction in the Himalayan region

There should be a appropriate policy and mechanism for preparedness in the context of disasters. There should be appropriate state preparedness to mitigate short term as well as long term impact of the hazards. Last, but not least is that fact that Himalayan life is very much dependent on natural resources and practices like agriculture, jungle, and animals. There should be effective provisions for livelihood development for people and communities living in the hills, especially for those living in extreme geographical conditions.

**Arvind Kumar Sinha**, Regional Climate Risk Reduction Project, UNDP-BCPR South & South, West Asia, New Delhi

I would like to bring a clear case of changes in precipitation in Kinnuar district of Himachal Pradesh. It is one of the areas, which is known as cold desert. Most of it is always covered with snow. It is situated in the Northern part of the Indian Himalayas, very close to Tibet. It is a habitat with tribal status. It is a very backward area in terms of accessibility, education, connectivity and livelihood support systems. It was having all the adverse poverty indicators just twenty year ago. One of the progressive families visited some other parts of the world and found similar climatic condition, topography, seasonal variations. He also noticed the crop practices and prosperity of the country. He explored the reason and found the country has abundance of apple production of very good quality, which is supporting their economy all along. He brought some of the plants of apple in this area and it was found very useful in terms of quality as well as productivity. It spread all over the valley in the last 20 years. Now, Kinnaur apple is known as one of the best apples in the country and has a very high demand. It fetches a good price and enriches the resource base of the region. The Communities of the region have selling on an average 20 million apples per village per year. It is sufficient for the village of 100 households approximately. Apple production is instrumental in bringing down poverty and backwardness from this area.

Apple production is at its peak in this area and almost the entire area has large number of apple orchards. Different valleys have different ratings of apples in terms of quality and productivity. Chango valley is known for the one of the best apple producing valleys.

Under the Regional Climate Risk Reduction Project, we had a good chance to interact with different communities, as it is one of the operational areas under this project initiative. We have collected evidence through community consultation and it has also been reported in the local newspapers. We can visualize the stress of the local community due to changes in the weather pattern of the area.

I have collected a few facts based on my interaction with the community. It may require some scientific and technical study to validate it. I will like to quote the stress of the community from
the emerging threat to their well established livelihood support system at community and state level.

- Kinnaur is known as a cold desert, it does not receive much rainfall even in the rainy season. For last two years, it is receiving unprecedented rain beyond the rainy season resulting in frequent land slides as the soil structure and rock strata are conglomerated in nature. It is becoming a threat to productive land.
- Too much rain also blocks the transportation of apples to the market. It is spoiled and degraded easily in absence of storage facility as well as long blockade of the link road as well as main road due to frequent land slides.
- Apple crop is being shifted towards higher altitudes for suitability of climatic conditions for this type of product. It is going to be more labour intensive and resource intensive to produce good quality apples as higher altitudes areas are known as glacial regions. There is also increase in the frequency of avalanches in the vicinity of the crop and community. It is posing greater risk to the community.
- Apple production is now taking place in severe cold desert areas, which are known as Kaza and Tobo valley, It is good that some unproductive lands are being utilized for production purpose and it is adding to the economic well being of the people but it might threaten the fragile eco-system of the area.
- Kinnuar apples had never encountered any kind of diseases, but this year it has been noticed that apple crop has encountered some of the newer diseases and this needs to be addressed.

These are the some changes, which have been noticed by the community in the Kinnuar Region of Himachal Pradesh. It is purely a community perspective but it is evident.

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**Mohinder Slariya, Environmental Sociologist, Chamba, Himachal Pradesh**

It is indeed a very good initiative by the community. I want to add something more in the reply of Subhadra Channa, undoubtedly, like other rivers of HinduKush Himalayas in HinduKush Himalayan states, the rivers of Himachal Pradesh have been heavily targeted for planned development. Himachal Pradesh has five river basins i.e. The Satluj, Beas, Ravi, Chenab and Yamuna and out of these five three major basins i.e. Satluj, Ravi and Beas have been heavily targeted for hydroelectric power project development since the 5th five year plan. However right from 1st five year plan, such type of developmental activities have been initiated by policy makers by constructing Bhakra and Pong dam that converted Punjab into a green belt and fulfilled the food requirement of the northern part of the country along with hydroelectric power generation of more than 1000 MW.

At present these three basins are contributing more than 72% of total potential assessed capacity of power generation in the national pool. Himachal Pradesh, to date, has more than 400 dams of different magnitudes and these dams are creating havoc in the physical environment, increasing seismicity because all these dams fall in seismic IV or V, depriving people their basic right of living which is a violation of their fundamental rights. People living in the vicinity of these power projects are facing the ill-effects and are compelled to live there. Many people living in the vicinity do not have the status of project affected persons and because their ecosystem services have been snatched they are forced to live under psychological trauma.

In other words, man created disasters in the form of developmental initiatives have a detrimental impact on the lives and livelihood of the people and their concerns must be assessed, estimated and resolved first before starting any developmental project in the Himalayan region. It just proves the statement given by Arundhati Roy in context of Narmada that these developmental activities are for National gain on local pains.
**Rashmi Gangwar, Centre for Environment Education, Lucknow**

Impact of climate change in the Hindu Kush region is being monitored and recorded by premier institutions like ICIMOD, GB Pant Institute of Himalayan Environment and Development, The Mountain Institute for more than a decade. The government ministries, selected NGOs and academic institutions from Hindu Kush countries are also vigilant about climate change consequences in the region.

However, established direct linkages between climate change and increasing disaster frequency/intensity are scarce so far though, the incidence of mountain specific hazards like heavy rains, cloudburst, avalanche, landslides has been increasing noticeably. Year 2010 witnessed extreme rainfall severely affecting the lives and livelihoods of the people. Himalayan communities have acquired required skills to cope up with the harsh conditions during their evolution. However, the pace of unplanned development is going too fast to give the fragile Himalayan ecosystems ample scope to recover and rejuvenate. Population pressure and climate change adding to the fragility which in turn makes people more vulnerable to any hazard.

The ongoing discussion gives a clear message that depending only on government mechanism will not provide any solution to ever increasing natural disasters in the Himalayan states. Though the efforts are being taken by National and state governments to setup decentralized disaster response mechanisms to help the communities during emergencies but it’s equally important that the capacity of the community is built to meet the challenges at individual and community level first before the government machinery comes into action. Once the capacity of the community is built, they can also help facilitate the government machinery for efficient service delivery.

I would like to share the experience of the Centre for Environment Education (CEE) from the Indian Himalayan region. CEE was one of the first agencies to respond to the Kashmir earthquake in 2005. Since then CEE has been involved in community based disaster preparedness in the affected and adjacent districts of Kashmir valley.

With an approach of capacity building on risk assessment, this initiative that involves the school system, community and village governance has focused on participatory mapping of vulnerabilities and capacities; preparing disaster response plans and practicing life saving skills. This is being done through extensive school based disaster preparedness drive covering above 2,500 schools from 5 districts.

Students and teachers are trained on climate change, it’s possible impact, what individual actions can help mitigate the impact and the adaptation measure to cope up the impact on people’s health and livelihoods. Schools are preparing evacuation maps and practice mock evacuation drills, learn fire fighting and primary first aid through school disaster response committees.

The community is involved in preparation of village level contingency plans aimed at helping them during any emergencies with guided evacuation to pre-identified safe locations and managing the situation till external help arrives. An overall awareness about climate change and individual actions to mitigate its impacts is being created in the Indian Himalayan region (IHR) through other programmes like ‘Paryavaran Mitra’ and ‘Creating Young Green Champions’.

There are number of NGOs in the region and some doing excellent work to address climate change. A directory of the NGOs from IHR is available on [http://www.ceehimalaya.org/dir/Default.asp](http://www.ceehimalaya.org/dir/Default.asp). Strengthening NGO capacity to address climate change threats and adaptation strategies and forming their networks will add to the government initiative in this direction. Communication in mountains which is not so good and prone to disruptions during disasters, needs to be improved.
Insurance is another mechanism being tried at some places to reduce vulnerabilities. There is also room for Public Private Partnership models for pooling resources and expertise for climate change adaptation and mitigation.

**Syed Arsalan Zaidi**, UNESCO, Pakistan

How has Climate change/Climate variability led to increase in frequency and intensity of disasters in the Hindu Kush Himalayas and how it has affected livelihoods?

We have yet to establish scientifically that Climate Variability is a major cause behind disaster frequency and intensity in the region but initial pattern of Climate system shift can be seen as a clear example like that of the Moonsoon System in Pakistan. A research work by Pakistan Meteorological Department (PMD) based on a long-term climate data, revealed that monsoonal zone of Pakistan (a region that receives almost 65% of total monsoon rains) has shifted 80-100 km from northeast (upper Punjab + Kashmir) towards northwest (Khyber Pakhtoonkhwa + northwest Punjab).

PMD argued in its study based on such climatic shift that the possibility of occurrence of heavy rainfall events during monsoon season, in the future, would be very likely over northwest Pakistan instead of northeast. Subsequently, the areas along western rivers (Indus and Kabul) would be extremely vulnerable to floods as experienced during this season.

The impact of the current floods in Pakistan has been the worst in the country's history - a sign of the mounting disaster risks that the country faces today, amplified by the phenomenon of rapid urbanization, sustained poverty, inadequately protected infrastructure, climate change and environmental degradation.

What has been the response from the communities and government institutions to reduce the risks of such variability/disasters? Have these strategies changed over time?

**Government Institutions and Policy Framework**

Pakistan like many other countries had a disaster response strategy predominantly centered on the “Emergency Response Paradigm”. The post-2005 earthquake led to the promulgation of the National Disaster Management Ordinance 2006, and the National Disaster Risk Management Framework are reflective of the initial steps by the country moving towards a pre-emptive and pro-active approach towards disaster management.

The National Disaster Management Authority (NDMA) is now the focal agency in the country for dealing with disasters. The National Disaster Risk Management Framework (NDRMF) was launched in March 2007 to serve as a policy document to provide strategic guidance for DRM activities in the country. It also highlights DRM priorities and provides a comprehensive plan of action for DRM-related activities over a five-year period. The NDRMF identifies nine priority areas for action, i.e., institutional and legal arrangements, hazard and vulnerability assessment, training, education and awareness, DRM Planning, community and local level risk reduction, multi-hazard early warning system, mainstreaming DRR into development, emergency response system and capacity development for post disaster recovery.
Climate Change as a subject comes under Ministry of Environment (MoE), who are in process of developing a Climate Change (CC) policy. There is intent by MoE to develop CC Adaptation plan for the country.

**Community and NGOs**

Climate Change as a subject is well advocated by NGOs at policy level and is a success story in Pakistan Environmental Advocacy history. NGOs and civil society are also working in pockets to help communities using community based approaches of resilience. Good examples are:

- Volunteer Response Groups and Networks
- Community Based Early Warning Systems

**To what extent communities depend upon government assistance and social networks to deal with crisis situations?**

Dependencies on Government support and social networks is very high, as most of the rural communities are vulnerable and live below the poverty line.

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**Saamdu Chetri**, PMO, Thimphu

I will try and answer the following three questions with my personal experience with regard to Bhutan.

- **How has Climate change/ Climate variability led to increase in frequency and intensity of disasters in the Hindu Kush Himalayas and how it has affected livelihoods?**

  Like anywhere in HKH, the Bhutanese mountains being a part of it are very fragile. With the changes in climate, the rains and storms are erratic and often very heavy at wrong times and wrong places. There were several times unthinkable storms when maize was just about maturing. Many parts of the country depend on it. Similarly, in October when the paddy is being harvested heavy rains have destroyed the crops. Climate change is also displacing animals that seem to run towards habitation, destroying crops.

  Recently, a team of MPs had to visit a place in the south of Bhutan between the basins of Rivers Sankosh and Raidak, because these rivers are washing away land and fields threatening habitation as well. Further, the rains have brought landslides around the habitation and threatened a whole village in one place.

  Climate change in this part has also affected growth of certain varieties of crops that used to do a lot better some 30-40 years ago. This is happening also through an indirect effect of rains that rise from Bay of Bengal cleaning all the ashes and impurities from the skies above Bengal and Bangladesh and pouring down the its loaded wealth in the area. For e.g. we grew a lot of small chillies that were food for parrots and this place was home for some of the most beautiful parrots. But now these small chillies are hardly grown, we see these beautiful parrots very seldom.

- **What has been the response from the communities and government institutions to reduce the risks of such variability/disasters? Have these strategies changed over time?**

  Communities in Bhutan are helpless because of the large destruction and small means to tackle it. Our GNH philosophy provides knowledge for people to behave according to the ecological system. However, the extent is so very large often when it occurs- it is just impossible to manage. The climate change is reducing the snow line because of melting glaciers and risk of
over-flowing lakes. Government is fully aware and measures are being put in place to reduce the
risk and strengthen the banks of some of the lakes in the mountains. GLOF is going to be a
constant threat for Bhutan.

Also a Department of Disaster Management (http://www.mohca.gov.bt/?mode=DEPT&var=21)
has been established to tackle and train people for disaster management.

Our community is not only small but poor to tackle any risk or destruction. Everything is
government supported and initiated in our case. Of course through community forestry and
school programs water catchment areas are deeply cared for.

- **To what extent communities depend upon government assistance and social
  networks to deal with crisis situations?**

As stated above the government is always on the rescue. Of course communities are involved but
mainly for labor resource. Our community is constraint being small and poor.

I am not sure if this information helps, but more can be found from websites such as the UNDP,
(http://www.undp.org.bt/environment.htm), Ministry of Agriculture and Forest,
(http://www.moa.gov.bt/moa/main/index.php), National Environment Commission,

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**Vimal Khawas, Sikkim University, Gangtok, Sikkim**

A combination of factors appears to contribute to the susceptibility of the Himalayan region to
various geo-environmental processes. The fragile geology and torrential rains play a significant
role in destabilizing the Himalayan terrain. The entire Himalayan belt is, both tectonically and
seismically, a very sensitive domain with strong tectonised rocks and fragile mountain slopes
vulnerable to the onslaughts of rains. The cumulative effects of past earthquakes in such a zone
aggravate these phenomena. Even a cursory assessment of the severity of different natural
disasters occurring in the Himalayan region indicates that the dwellers of this region are living
with great risk. Yet a comprehensive security mechanism in order to cope with these risks in the
field has yet to be designed and developed.

Environmental insecurities across the Himalayas have been responsible in guiding and directing
civilizations in the area over the millennia. The relationship between human and environment in
the Himalayas has been very close since antiquity. In other words, environment and socio-
ecomic considerations are inseparable in the Himalayas. There has been a symbiotic and
intimate relationship between humans and environment over the ages. However, more recently,
things are changing for bad in this fragile resource zone.

Initially, humans adjusted themselves with the complex geo-environmental set up of the region
and hence environmental determinism was very strong. In recent times, however, we have been
seeking to adjust the Himalayan environment according to our needs thereby making way for
environmental degradation in this other wise susceptible region. It has resulted in the
imbalance in the environment and aggravated the natural processes. This is a very serious issue
having far reaching implications on the security of the Himalayan environment and human beings
living therein in the days to come.

Himalayas, often, regarded as the cradle of South Asian civilization is at present suffering from
various human onslaughts - in addition to numerous natural forces that have been acting and
reacting in the region in the form of faulty development policies/ventures, unprecedented
population growth and degradation/depletion of its rich natural resource bases.
Further, the situation is deteriorating with every passing day and the future of the Himalaya looks clearly grim, given the rate of onslaught the region is forced to tolerate. Further, the Himalaya has been a battleground between environmentalists/conversationalists and commercial/vested interests since the last half century. Such a situation has only politicized pertinent environmental issues therein and hence have done little good to the region. In the process, indigenous and tribal populations of the Himalaya have been sidelined and are often regarded as direct agents of ‘Himalayan Environmental Degradation’

The Himalayas should not only be looked at as a military frontier. It should not be treated merely as a physical entity because it also has vibrant living aspects. The Himalayas cannot be independent of people living therein nor the inhabitants without their habitats. From the point of view of the larger human interests of the region and its neighboring highlands and lowlands both within and outside South Asia, it is high time the planners, policymakers and researchers employ the human security approach to the region. Environmental security is the most important human security parameter of the Himalayas that exerts deep bearing on the society, economy and polity of the region.

Environmental security challenges faced by the Himalaya are primarily physical in nature and ranges from local to global. However, majority of the physical threats to human security in the region are often aggravated by unscientific anthropologic activities. Therefore, it is next to impossible to outline a clear-cut mitigation plan to reverse the ongoing trend. It is, however, important to note that Himalayan problems can neither be solved by adopting megabuck high tech approach nor by doomsayers’ dream that there is no longer hope at all for the environment and human well-being in the region. What we need is a cooperative and coordinated approach where there is a mixture of deep concern and cautious optimism. In this regard, while indigenous mountain communities need to have their major stake, avarice and indifference, both from within and outside the region, should not be allowed.

At the macro level, the first errand should be to revisit all the development policies that are functional in the region and ratify them in order to make them region and people specific. Often, the Himalayas has been kept at mercy of the mainstream development policies that have little or no relevance in the region given its geo-environmental and socio-cultural dynamics. There are areas that are quite rich in natural resources but are inhabited by poor people. The inhabitants have been suffering under harsh environmental conditions, carrying out subsistence economic activities, based primarily on animal rearing and rudimentary farming. Such situation needs upgradation. Promotion of adequate education, health and food security of the mountain people is the need of the hour.

The policy makers, development planners and project implementers should not regard Himalayas as an appendage to economic and political interest of indo-Gangetic plains. It is high time they recognized the geo-political and geo-environmental significance of the region at local, regional and global levels. It is also vital that geomorphologists, geologists, geographers, environmental scientists, climatologists, and other scientists are included in the interdisciplinary experts’ team at the highest level of planning process both at the national and sub-national levels for larger human security of the Himalayas and sustainable development of the region. Ignorance and neglect of geo-environment is the cause of many developmental and security problems of the region impacting human security of the Himalaya and adjoining lowland resource zones.

Further, development planning across the Himalaya must not only aim at improving quality of life but also should have a target of ‘Zero Disaster Impact’. Disasters erode away not only the resource base but also cause loss of human life and bring about unprecedented human insecurities. It further requires extraordinary post disaster non-productive expenses. Efforts need
to be focused to use efficient flow sheets absorbing newer technologies and ideas and incorporate Disaster Management Plan for terrain induced as well as human induced disasters in the development planning process of the Himalayas.

Terrain induced natural disasters cannot be stopped or diverted away but damages can be prevented and minimized with proper appreciation of geology and other geo-environmental parameters. On the other hand, human induced disasters are the result of in-efficient flow sheets and/or absence of a Disaster Management Plan. All development projects irrespective of financial or physical outlays need to have inherent nucleus of disasters, in general bigger the project larger the nucleus.

The policy planners are yet to workout a comprehensive disaster management policy for the Himalayas as a whole. Such a task would require sustained cooperation between the three major Himalayan Countries of India, Nepal and Bhutan. Besides, immediate neighboring countries like Bangladesh and Pakistan should also find place in the formulation of such a policy.

It is also important to rationally involve the media in responsibly spreading environmental awareness through talk shows, interviews and write-ups. Mapping of vulnerable areas and demographic distribution is another important method so as to keep a special watch on the vulnerable regions of the Himalayas. It is important to list down volunteer organizations, non governmental organizations, institutions of higher learning and research and suitably encourage, empower and aid them to work on the various pertinent environmental issues and their implication on human security.

What the Himalayas also needs is an international summit. Jack Ives (2004) proposes a ‘Himalayan Summit’ to be organized with participation from all regional sectors- from governments to universities, to citizens’ committees and NGOs. He also suggests that the summit should include representation from outside the region and be modeled on the line of the Rio de Janeiro Earth Summit (UNCED) but on a correspondingly smaller scale.

Last but not the least, human security of the Himalaya is a collective concern and we need to address it collectively. Environmental issues know no political boundaries. It is one area where nations must cooperate to find collective solutions to the challenges. Nations encompassing the Himalayas need to come together to deal with environmental uncertainties - both physical and human made.

Coherent and comprehensive sub-national, national and inter-national strategies and capabilities to handle environmental uncertainties is the need of the hour. In order to make effective use of capabilities we further need planned bilateral and regional cooperation.

The scientific community should observe carefully the natural processes and anthropogenic activities over time, utilizing rigorous techniques for precise measurement and scientific understanding. Such knowledge will help us improve future assessments and policies and thereby the development paradigm and human security of the region.

Amber Masud, United Nations Development Programme, Pakistan

Mountain ecosystems are supposedly the most sensitive type on earth towards climate variability and change. A slight change in one parameter can result in significant other changes. This makes mountain ecosystems the most visible indicators of climate variability and change. According to various studies, global warming has increased glacial melt which could cause water shortage, an increase in frequency and intensity of disasters, severely affecting lives and livelihoods of the
communities. In case of Pakistani Himalayas, Karakorum and Hindu Kush Mountains, the occurrence of events such as glacial lake outbursts floods (a common phenomenon now), flash floods, river bank erosion, landslides/slope failure, avalanches and extreme weather conditions such as heavy snowfall, prolonged drought and torrential rains, cloud bursts and devastating floods has increased.

Over the past few years the region of Gilgit Baltistan has been hit by one natural disaster after the other. Communities in the region have been a victim of many glacial lake outburst floods, flash floods, cloud outbursts and landslides in the past three years. Due to these natural disasters that have been wreaking havoc in the region during the past few years, the people and habitat of this area has suffered immensely. The increasing number of natural catastrophes happening in one place in such a short span of time, makes this region a perfect case for the study of climate change and variability, and its adverse affects in the HKH region. It would not be fair to say that temperature rise resulting from CC has been the sole culprit, but there have also been periods of early and excess winter snowfall which caused crop failure and delays.

During the past few years, increased frequency and intensity of climate change / variability induced disasters such as floods, droughts, flash floods and cyclones has resulted in heavy damages to agriculture and livestock in the country. Agriculture and livestock being the main sources of livelihood in the mountain areas, are challenged to provide adequately for the growing population. This sector is the most vulnerable to CC and variability, and the same is having a serious impact on food security of the country because of reduced productivity and losses caused by crop failure etc. Moreover, it is important to note that small land holders and farmers are more vulnerable to impacts of CC and variability because of unavailability of financial resources and support. Small scale farmers living in remote mountain areas also have limited access to new farming techniques and technologies which considerably reduces their production potential. However, according to research involving future scenario, it is expected that production of cereals will benefit from the changing climate (Planning commission, GoP). Livestock sector is also very vulnerable to impacts of climate variability and change. Impacts include decreased production of milk and meat, changes in available food supply in the pastures, changes in fauna in the grazing rangelands, diseases, changes in habitat caused by climate variability and change induced disasters such as floods, droughts and the like.

The most recent natural disaster in the region was the devastating monsoon flooding caused by unusual precipitation, even in the rain shadowed region of the Karakorum. Many human stories have unfolded in these remote villages due to these natural disasters. Moreover due to the ever increasing frequency of natural disasters at an alarming rate, the threat to vulnerable mountain communities is increasing day by day and their resilience is tumbling to the ground. Apparently, the inhabitants of Gilgit Baltistan as well as other mountain areas in the country are the direct recipients of impacts resulting from climate variability and change.

The collective response of government institutions and communities has changed greatly post 2005 earthquake. There has been considerable improvement regarding DRM strategy in the country which now seems to focus more on advocacy, institutional development and capacity building. Organizations such as the UNDP is a major sponsor for support to NDMA and PDMAs not only for their formation but also for their work. A large amount of financial, human and technical resources have been allocated to ensure proper functioning of these organizations and for the implementation of the priorities identified in the National Disaster Management Framework. However a clear and defined strategy for managing climate risks has not been formulated as yet. Also, the ministry of Environment government of Pakistan is working on climate change policy which is still in its initial draft form. Realizing the importance of DRR and climate change adaptation, most of the non-governmental sector in the country is also in the process of integrating DRR and climate change in their programmes. In mountain areas of the
country, communities have been practicing risk mitigation traditionally and are devising suitable climate change adaptation techniques, which of course are also resulting in reduction of risks. However, we still need to explore and document the same for future interventions. The ongoing efforts to communicate information on CC and variability to general public is far below the requirement. Such efforts need to be expanded in the region, making use of the available tools such as electronic and print media.

Communities depend greatly on government assistance in any crisis situation as these situations put a great demand on the local government authorities and other social networks for restoring the situation to normalcy under all circumstances. Government is obligated to assist the communities in addressing issues such as immediate relief, recovery and rehabilitation. No matter how prepared the communities are, government’s assistance is always crucial in lessening the impact of a disaster. Moreover, local administration is also responsible for ensuring social order and security in times of disasters (during various phases emergency relief, recovery and rehabilitation).

Sanaullah Khan, United Nations Development Programme, Pakistan

How has Climate change/ Climate variability led to increase in frequency and intensity of disasters in the Hindu Kush Himalayas and how it has affected livelihoods?
To answer this question we need to check;
• The sensitivity of mountain ecosystems to temperature variation
• The extent and accuracy of our knowledge about the Hindu Kush Himalayas.

According to Sharma et-al (2009) and Viviroli and Weingartner (2004). among the most fragile environments on earth, mountains come on top. Since mountain’s vertical (altitudinal) dimensions creates gradient of temperature, precipitation and solar radiation, they respond very strongly to even small changes in temperature (Kohler and Maselli, 2009; ICIMOD, 2009 and Sharma et al 2009). The statements above give a fair idea about the sensitivity of mountain ecosystems to climate change.

Mountains have been described as the “blackest of black boxes in the global hydrological cycle” (Bandyopadhyay et al,1997:131).Also the knowledge of eco-hydrology in mountains is very limited, less reliable and less precise compared to the plains (Bandyopadhyay, 2009). This is also true for the Himalayas as the data available for them is very limited compared to the other mountain ranges such as the European Alps (WGMS, 2008). Most studies of the mountains have excluded the Himalayas due to lack of reliable rain gauge data and its very complex and extreme topography (Eriksson et al, 2009). Little progress has been made in the study of this area in spite of being pointed out by mountain scholars repeatedly (Messerli 2009).and generalizations have been made from studies carried out in areas widely separated in space and time (Nogues-Bravo et al. 2007)

From the discussion above it is clear that a lot of research needs to be done to accurately study the impact of climate change in the region. In spite accurate data glacial retreat and temperature rise have been noted as a general trend in the region. GLOF (Glacial Lake Outburst Flooding), landslides and avalanches are the hazards that are presumed to be triggered by the change in temperature and the frequency of disastersis on the rise.

Climate change has brought new opportunities as far as livelihoods in the region are concerned. Tourism and agriculture, the main stays of mountain economy have both benefited from higher temperatures. New variety of crops and new places to explore are on the offer in the changing climate. The opportunity is there and it is up to the people to exploit it. Several studies have reported higher yields in the recent years.
What has been the response from the communities and government institutions to reduce the risks of such variability/ disasters? Have these strategies changed over time?

Generally governments have paid little attention to these areas across the countries and hence the Hindu Kush Himalayas are host to some of the world’s poorest people. People have generally relied on indigenous knowledge and response rather than preparedness. In the recent past, different organizations and NGOs have initiated various DRM projects in scattered places in the region. Due to the lack of coordination and integration efforts little benefit has been attained in the overall DRM related activities. World is paying more attention to the region now and things are expected to improve in the days to come.

To what extent communities depend upon government assistance and social networks to deal with crisis situations?

It is social capital rather than government support; people rely on when it comes to dealing with crisis. There are different informal and undocumented safety nets based on mutual understanding for dealing with adverse situations.

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Amit Tuteja, SEEDS India, New Delhi

How has Climate change/ Climate variability led to increase in frequency and intensity of disasters in the Hindu Kush Himalayas and how it has affected livelihoods?

With reference to Hindu Kush Himalayas (HKH), in reality the data collection and analysis is not as comprehensive as in the case of other regions like Scandinavia etc. One of the main reasons may be the population, which is quite dispersed and the communications which is far more difficult, due to lack of basic infrastructure.

However based on reliable studies and extensive research work on the subject matter, it can be said that climate change has the linkage with disasters and the livelihood of vulnerable communities. Following are few available facts and observations:

- As per Dyurgerov and Meier’s global study in 2005, the Himalayan deglaciation appears to be the fastest in comparison to the other regions of the world as mentioned in the research paper submitted by ICIMOD in SDMC journal *Disaster & Development (April 2010)*.
- As per IPCC Assessment Report 2007, the climate variability and melting glaciers in Himalayas are increasing the risks of natural disasters like flash floods and landslides in the hilly settlements. The increase in size and volume of glacial lakes and formation of new lakes have made HKH region more prone to GLOF, particularly Nepal and Bhutan. In India the Gangotri, Satopanth, Shingri, Siachen and Pindari glaciers are live examples. Their rate of retreat has been well documented by Garhwal University's Deptt. of Geology (Uttarakhand).
- As per the INCCA Report (Indian Network for Climate Change Assessment) 2010, there will be 2.6 degrees rise in temperature of Himalayan region, and rainfall will increase to 12% by 2030 with respect to 1970. This will lead to glacier melt and forest fires. The emerging impacts of climate change will be in the form of flash floods, landslides, loss of agriculture area, and increase in Malaria cases. With the temperature rise, there will be upward shift in agriculture, which may result in loss of permanent pastures and grasslands.
- From the record of Indian Meteorological Department (IMD) unprecedented events have occurred very frequently in recent times. The Parchu flash flood in Himachal 2005, Uttarakhand flash flood 2010 and the recent Leh flashflood 2010 (rainfall intensity 250 mm/hour) are just few evidences. The group of disaster management experts and environmentalists has linked these events as a result of climate change.
The latest Annual Report of Ministry of Environment & Forests (MoEF) Govt. of India 2009-10, also pointed out climate change effects on the biodiversity, especially highlighted the forestation issues. Primarily due to manmade activities, including road construction, cutting trees for heating purpose, the forest cover is getting reduced in most of the Indian states, which in turn is going to affect the natural climate in the long run, and will directly or indirectly hamper the livelihood of the dependent community.

Human Development Report also indicates that melting of HKH glaciers and retreating prospects may have negative implications towards human development in time to come. It can not only affect agricultural land but also can destroy the human settlements in respective regions.

What has been the response from the communities and government institutions to reduce the risks of such variability/ disasters? Have these strategies changed over time?

In general, the response from respective Governments takes time as the Government agencies have to follow certain procedures, taking approvals and getting clearances for the transparency purpose. However their intent is also the same, to help the communities at the earliest, as & when required.

Nowadays, after facing a number of disasters and visualizing the probable consequences, the Government agencies are also coming forward with specific strategies in respective countries. For example: The Government of India has come up with the National Action Plan on Climate Change, which lays down priorities and future actions on addressing climate change. As a part of it, total eight missions have been formed, including Himalayan Eco System as one of them, to address the climate change mitigation and adaptation aspects. Further in order to strongly address the climate change adaptation elements at the national level, in India the National Food Security Mission (NFSM) and National Rainfed Areas Development Authority (NRADA) have been taken up by two separate ministries of the Government, on mission mode.

In India, there are some selected Government Research Institutes, which are dedicatedly doing climate research work, variability in the Himalayas and keeping track of all major and minor events. The following institutes in my knowledge, are addressing and capturing climate change extensively:

G.B. Pant Institute of Himalayan Environment & Development, Itanagar (Arunachal Pradesh)
Wadia Institute of Himalayan Geology, Dehradun (U.P.),
College of Horticulture and Forestry, Solan (H.P.)
HNB Garhwal University, Garhwal (Uttarakhand).

However, now it's time to take concrete steps on the ground for the affected/ vulnerable communities by taking grass root level initiatives like establishing Innovation centers, Research Labs, Adhunik Krishi Kendras, providing knowledge updates and with desired community.

At community level, earlier the local CBOs and NGOs were just able to supplement the emergency response with local coordination and available resources. However these local communities had the traditional knowledge and local wisdom in the past as well, to reduce the disaster risk element, but most of them were operating in different silos.

In the changed scenario, currently these locally based organizations and allied communities are working together. Due to their synergic efforts, knowledge enhancement/ technical knowhow and by sharing of resources, these communities are serving the purpose to some extent, by addressing risk elements.
In India, the Alliance for Adaptation & Disaster Risk Reduction (AADRR) is a similar kind of network, working towards climate change adaptation and disaster risk reduction.

In Nepal, there are community based organizations like LFP (Livelihood & Forestry Programme), Li-Bird and Practical Action Groups etc. They all are working towards scaling up the community based adaptation initiatives in Nepal, through climate friendly livelihood and forestry programmes.

**To what extent communities depend upon government assistance and social networks to deal with crisis situations?**

- Most of the Disaster Management experts would agree that Community is the first responder at the time of crisis. As the Government assistance takes some time to reach from the nodal point to the crisis site. Hence despite largely depending upon the government, now communities are being sensitized through community based disaster management programmes and similar initiatives, to deal with crisis situations.

- Here the vital roles of social networks come into picture. There are a number of networks in India, working in this direction at various levels. Sphere India, is a national level network, apart from it, there are several regional/zonal/state level networks exist in Himalayan region like Himalaya Niti Abhiyaan (Himachal Pradesh), NGOs Forum (Uttar Pradesh) etc.

**In addition members may kindly share case studies, documents and related literature relevant to the above areas.**

- Recently, SEEDS in collaboration with LEDeG (Ladakh Ecological Development Group) and with support from CORDAID & other partners, have built climate adaptive and environmental friendly houses in Leh for the flash flood affected families to help them to survive in -30 degrees temperature in coming winter. These houses prepared by the local material (mud, stone) with appropriate mix of cement, to stabilize the structure which are best suited to adapt to climate change. The intervention also included thermal and environmental features to ensure safety from future flash floods and cold.

  Set up of Mobile Health Clinics to provide technical, material and manpower support, and impart training to the local construction workers, taking into consideration the climate variability and DRR aspects. To get more details about case studies pertaining to climate change in Himalayan region, please visit: [www.seedsindia.org](http://www.seedsindia.org).

- A few months ago, DD News telecasted a documentary on climate change adaptation, with a case study of Banjar, Kullu (Himachal Pradesh). The case was on shift in the seasonal weather pattern due to climate change, as a result of it, the lives of people are getting affected. The learning is that how the villagers adapted to these changes, utilized their land in an effective manner by vermicomposting, developing green belt and applied organic farming with better results. For information, SEEDS also documented this as one of the case studies in its 2008 edition of *Boiling Point* (A compendium of climate change case studies).

- In the recent edition of Down to Earth magazine, there is a case study of an educated and aware farmer, Mr. Negi from Kinnaur (Himachal Pradesh). The story is a good lesson to learn, how to adapt the climatic changes in a cold desert and create asset through applying traditional wisdom in farming.

- For more reference in context of IEC, there are few DVDs available like *The Weeping Apple Tree* (by Mr. Vijay Jodha), and *Call of the Himalaya* (by Mahesh Bhatt). These short films may help in highlighting the importance of the community and motivating them to adapt to climate change, especially in the hilly regions.
Usman Qazi, Pakistan

I shall confine my contribution to the second and third question in the query.

The impacts of climate change have become increasingly visible on both productive and consumptive patterns of people's lives. On the productive side, especially in the area of rural livelihoods, people have been observed to make efforts to adjust to the changing climatic conditions. The cropping practices in most parts of the developing world remain largely un-assisted by the agricultural and livestock extension departments, and the adjustments or introduction of new varieties or practices spreads by word of mouth or through informal peer-to-peer learning. In a rapidly changing climatic condition, sole reliance on the rural peasants' informal learning will definitely induce unwanted hardship for them, in the form of costly failure of experiments. The formal empirical research takes place in the realm of the research farms and experimentation plots. The creation of a strong linkage between the research and extension wings of the state apparatus for facilitating farmers is a daunting challenge.

The rural communities in developing countries are constrained by a lack of knowledge about the global picture of climate change and will forever remain dependent on the state and non-state service providers for assistance in managing the impact of climate change on their lives. It is especially true for mountainous communities where events taking place in the remote upstream areas may have catastrophic implications for them, as demonstrated in the recent floods in Pakistan. It is therefore vital to create a system of information dissemination, especially in the areas of agricultural research and extension and early warning to avoid hardships. The state and civil society organizations will have to play a pivotal role here.

Babar Khan, WWF-P Northern Areas, Pakistan

My response to the questions raised are given below:

1. Climate change/ Climate variability led to increase in frequency and intensity of disasters in the Gilgit-Baltistan and how it has affected livelihoods?

Climate variability and its impacts are progressively more evident in fragile ecosystems of Gilgit-Baltistan (GB). Glaciers of the area and other fragile ecosystems are considered to be more sensitive indicators to global warming and climate change. The associated hydro-metrological hazards of the area confirm the climate change impacts on different sectors. Climatologist know that even minor disparity in weather can lead to momentous shifts in the local minor climate, which can in turn drastically affect fragile ecosystems, rural life, livelihood and infrastructure.

The general overview about climate change and their sectoral impacts are emerging issues, but discussions and research on climate change, their associates hazards and long term sectoral impacts need to be addressed on priority bases in Gilgit-Baltistan region of Pakistan. Loss of habitat, species extinction, less grasses in pastures, diseases in wild animals, pest attack, increased frequency and intensity of melting of glaciers, high turbidity in water bodies (streams and rivers), heat waves, cold spells, droughts, could bursts, land sliding, water born epidemics, avalanches, heavy rain falls, heavy snow falls, lake outburst floods, flash floods were identified in the area as major concerns. Disrupted social infrastructure, commotion limited livelihood options, fragmented crops, and moribund poor economy were also clear evidences of climate change and their sectoral impacts on Gilgit-Baltistan.
The most recent and highly frequent hydro-metrological risks in the area have been flash floods, droughts, cloud burst, avalanches, Glacial lake outburst floods, heavy rain falls and secondary hazards like landslides, mudflows and debris falls, recorded from 1999 till date, which provide an overview to vulnerability and risks of climate change and their sectoral impacts on Gilgit-Baltistan.

Climate change induced hydro-metrological hazards and harsh climate conditions created hurdles and limitations particularly to livelihood options in the area due to heavy rain falls and landslides, all connecting roads between Gilgit (GB Headquarter) and other districts have been occasionally blocked for different periods of time, which are thought to be an ultimate menace to various sectors such as transportation, small scale business, communication, agriculture, construction and other means of livelihoods in the area.

2. **Response from the communities and Government institutions to reduce the risks of such variability/disasters? Have these strategies changed over time? In Gilgit-Baltistan?**

Disaster response is a natural adoption reaction of the communities and Governments in any part of the world, but limitations for community based disaster risk management and response are capacity, technical managerial performance, disaster mitigation plans, National and regional priorities of the Governments etc. Gilgit-Baltistan Disaster Management Authority (GBDMA) is a newly established department, which is responsible for response to disasters in Gilgit-Baltistan region. It is working for its institutional strengthening to improve their capacity and management skills. Hazard prone communities of GB, mostly living on alluvium fans, river terraces, and under/adjacent to glaciers are highly vulnerable to natural hazards. Following are some of the notable points:

- Capacity of GBDMA is considered to be increasing for community based disaster risk management.
- Experience of Ataabad landslide and recent flash floods will be helpful as model management practices for GBDMA.
- Newly appointed disaster management experts are working with other stakeholders on management plans at district level.
- Conservation committees for preserving natural forest and pasture management can be effective for community based disaster risk management.
- Introduced protected natural resource management related structural mitigation practices in some parts of the Districts Gilgit, Hunza-Nagar and Astore will be future tools to minimize the potential of hydro-metrological hazards.
- Protection and Conservation of natural resource in Bagarote, Hisper, Naltar, Nomal, and some others palaces can help in future mitigation of climate variability and change induced disasters.
- Rotational cropping system in some parts of the Gilgit-Baltistan was found to be helpful to combat climate change and variability induced risks, it also guarantee security of various endangered species and their habitats.
- Cropping systems in lower Hunza will be a model demonstrations for other places to minimize pest attacks.
- Local Soil management techniques in Gudyai and Bubin valleys are helpful for improved production of crops and food security.
• Reduced number of livestock in different parts of the Gilgit-Baltistan may help decrease pressure on pastures and their productivity
• Protection of the pastures in Bagarote and Khunjerab National Park can be a model for management of other pastures
• Use of farm yard manure and organic fertilizer (i.e. compost) in the study areas will guarantee safety of the prevailing agro-ecological systems
• The decision to avoid construction of shelters near Rivers and Nullahs in some parts of the area will decrease socio economic and ecological vulnerabilities of the poor and hazard prone communities
• Introduction of native species of crops, fruits and plants in some parts of the RCRRP study area may ensure security of the prevailing agro-ecological systems
• Indigenous monitoring of glacier’s behavior in upper Hunza can be part of the community based Early Warning System for Glacier lake outburst floods in the region
• Climate change compatible shelters in Naltar Bala, Bubin, Derlay and Hopper can be demonstrated for other communities

3. To what extent communities depend upon government assistance and social networks to deal with crisis situations?

Dependence of the poor and hazard prone communities of GB on Government assistance and national and international aid is no doubt very high due to the poverty, accessibility, lack of community based disaster risk management systems. A few communities like that of Naltar and Nomal were found active in helping people during the recent floods, as they were trained under the DIPECHO funded RCRRP project just before the floods. However, majority of the communities do not have knowledge and skills about Community Based Disaster Risk Management (CBDRM) and are still dependant on others in case of disaster situations.

Rabia Khattak, United Nations Development Programme, Pakistan

The role of local government authorities in Disaster Risk Reduction (DRR) and in dealing with disasters is very important for building community resilience, especially in remote areas. Also, the commitment of local government authorities is the first and foremost step towards initiating and implementing the agenda of DRR. In this regard, capacity of the local government authorities should be enhanced so that they are able to reduced disaster risks, build community resilience and timely manage disasters.

Mountain communities in particular are subject to frequent disasters which can be handled efficiently even if small scale preparedness and mitigation practices are made part of other routine activities. Moreover, local or district government authorities could also be instrumental in mobilizing funds and resources for addressing bigger risks which mostly require structural mitigation interventions such as spillway construction, construction of gabions and check dams, slope stabilization etc. One of the most important areas of assistance is to support and formulate policies and frameworks that address issues such as hazard vulnerability and risk assessments, disaster risk reduction, climate risk management, supporting livelihoods and reducing poverty with a special focus on addressing increasing gender issues. Moreover, it is important to note that social networks within communities are essential part of government support and without their assistance any type of crisis situation would be difficult to avert.

District government authorities have always been very active in responding to disasters as traditionally they have been all over the country. However after the promulgation of the National
Disaster Management Ordinance (NDMO) in 2006 and followed by establishment of NDMA, PDMAs and the DDMAs, their role has been elaborated further.

The empowerment of DDMAs and district DRM planning process will be a key achievement of the current DRM system in the country, showing that the key recommendations of the Hyogo framework of action (HFA) 2005-2015 has been considered and given due priority in the National Disaster Management Framework (NDMF). The District Disaster Management Authorities (DDMAs) can play a very important role in providing assistance to the communities in building a culture of resilience and improving the situation of risk reduction in their respective districts.

DDMAs are taking lead in identification of hazards and assessment of risks in their districts and are producing the information in the form of comprehensive district disaster risk management plans. Fortunately, the whole process is taking place with the consultation of key stakeholders in the district i.e. civil society, CBOs, communities etc.

The district governments in all flood affected districts worked in close coordination with the NDMA, PDMAs and other key national / international partners for managing the disaster situation. Also, during the cyclone Phet of June 2010, the district governments of coastal areas quite timely issued the early warnings and evacuated local communities to safer locations. The above two disaster situations have been witness to the importance of disaster and local DMAs and how their support and assistance is vital to vulnerable communities in times of crisis/disasters. Hence it must be established that the DDMAs and other social networks are most important in engaging and empowering local communities in disaster risk reduction activities.

Sarat Panda, Bureau of Crises Prevention and Recovery-UNDP, Bhutan

Climate variability and change in the Himalayas and in the Hindukush is certainly showing its impact as it has started affecting different sectors including community livelihood. I will drive home this point from series of interactions with different sector heads in Punakha, Wangdue and Bumthang and other cross-sections of society during the research study we carried out under the Regional Climate Risk Reduction Project.

- Sectoral focal points those with long years experience of working in various government positions across the country have told that they have been observing a changing pattern in rainfall which is sudden and untimely. Volume and duration of snow has come down over the years. Similarly, the untimely/unexpected frost conditions during the harvesting seasons has been affecting potato production. ‘Chili’ production has also more often than not been destroyed by untimely rainfall. Even for certain variety of agricultural crops, fruits and vegetable production people are observing change in altitude pattern. For instance, citrus fruit like orange which people use to grow in Punakha find the weatherunsuitable now. Similarly, apple production has also gone down in Bumthang, Thimphu and Paro. Bumthang because of altitude, people earlier were not able to cultivate paddy, which they are doing now. Both community and the sector representatives have attributed this changing weather pattern to climate variability and change. These variability in climate is affecting the livelihood of people in Bhutan where majority of the population practice subsistent agriculture/farming.

- The communities so far is trying to accommodate these changes. With lack of accurate monsoon prediction system, farmers are trying to cope with the changing weather pattern and the vagaries of nature. Those farmers who are little well off are in a position to go for an alternative crop, in the event of untimely/unseasonal rainfall resulting in crop damage. However, majority of the farmers have to bear the loss.
Communities depend upon their immediate neighbors’ and relatives for support in case they lose their crop. The crop insurance system is yet to be in place in Bhutan. The Royal Bhutan Insurance Corporation is thinking of introducing crop insurance, however, it may take time. In the mean time, the Department of Agriculture is making efforts to help farmers suggesting alternative cropping patterns and pest resistant crops. Agriculture officials, as reported, also feel the need for improving the monsoon forecast system in the country to better help the farmers.

Madhavi Malalgoda Ariyabandu, UN International Strategy for Disaster Reduction for Asia & the Pacific (UNISDR), Bangkok

I would like to share with you the learning from recent studies conducted by UNISDR Asia Pacific Secretariat and GFDRR on the glacial lake outburst flood (GLOF) in Hindu- Kush Himalayas.

Formation of glacial lakes in the Hindu Kush-Himalayas and GLOF risk assessment has been published in 2010 by United Nations International Strategy for Disaster Reduction Secretariat - Asia and Pacific (UNISDR - AP); Global Facility for Disaster Reduction and Recovery, the (GFDRR) and International Centre for Integrated Mountain Development (ICIMOD).

The report can be downloaded at: http://www.unisdr.org/preventionweb/files/14048_ICIMODGLOF.pdf

This report outlines a methodology for mapping glacial lakes and identifying those that may be dangerous. Preliminary findings on selected glacial lakes are presented. The report suggests that while the danger has sometimes been exaggerated, it is nevertheless essential that a rational basis for risk assessment be developed. Given the extremely mountainous, inaccessible nature, and high altitude of the immense area involved, application of a wide variety of remote sensing techniques is promoted as a necessary first step for observing and identifying the stages of glacial lake development. The assessment recommends that this must be followed by detailed glaciological and geophysical field investigation of those lakes that warrant more thorough investigation. Also it stresses the need for more extensive scientific information about glacial lakes, enhanced by monitoring and early warning systems, with the engagement of the communities, together with mitigation measures. The report intends to provide information for planners, policy makers, and development scientists, and a basis for regional collaboration aimed at reducing the glacial lake hazard.

In addition, a preliminary desk review was conducted to review the potential and the feasibility of the use of remote sensing techniques for developing early warning systems for GLOFs in the region.

Many thanks to all who contributed to this query!

If you have further information to share on this topic, please send it to Solution Exchange for the Disaster Management Community in India at se-drm_se-clmt@solutionexchange-un.net.in with the subject heading “Re: [se-drm] Query: Disaster Risk Reduction in the Hindu Kush Himalayas-Experiences.. Additional Reply.”

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