

Synthesis report of the global e-conference on

Climate Change and the Himalayan Glaciers

7-30 May 2007

■ PREPARED BY MR. TEK JUNG MAHAT•

Background

Glacier and ice cover some 17% of the greater Himalayan region, a total area of nearly 113,000 sq. km, the largest area covered by glaciers and permafrost outside the polar region. The Himalayan region alone has some 35,000 sq. km of glaciers, and a total ice reserve of 3700 cubic km. It is the source of the nine largest rivers in Asia, whose basins are home to over 1.3 billion people. Various studies suggest that the warming in the Himalayas has been greater than the global average. Warming in Nepal and Tibet increased progressively within a range of 0.2-0.6°C per decade between 1951 and 2001, particularly during autumn and winter. The length of the growing season (daily temperature > 10°C) has increased by almost 15 days over the last thirty years (Xu et al. 2007). Glacier melt in the Himalayas is likely to increase intensity and frequency of various environmental risks including floods and avalanches, failure of moraine dammed lakes etc. and affect water regime within the next couple of decades. Recent summary of IPCC working group predicts "If current warming rates are maintained, Himalayan glaciers could decay at very rapid rates, shrinking from the present 500,000 square kilometers to 100,000 square kilometers by 2030s". Since the mountains and surrounding valleys are warming at an alarming rate, it is believed that the increasing temperature will also affect the biotic pool resulting to extinction of some of the precious species. Moreover it will decline productivity of biological sys-

tems, change floral composition, increase uncertainty, spread diseases and increase in risk of hunger and famine in some locations, finally putting human security at a high risk.

In this context *ClimateHimalaya*, an informal and loose network of climate change professionals, promoted by the *Environmentalists' Association of Nepal*, realised a need to develop a mechanism in which all regional as well as international experts working in this region can interplay to produce better information to tackle various issues related to climate change and its subsequent effect on different landscapes and at different ecological levels and finally to human security. Present e-conference is the first attempt toward attaining this goal.

Despite of its low profile in terms of patronage and publicity we received about 161 entries from around 150 participants representing 26 countries of Africa, Asia, Europe and North America. Out of this about 60% were from Himalayan countries and rests were from other countries of Africa, Asia, Europe and North America. The list includes many research scholars of Himalayan origin.

To keep the discussion coherent and maintain the subjective flow, the event was divided into three sessions, namely, "**Current Status and Pressure (7-15)**", "**Future Potential Threats and Challenges (16-22)**" and "**Future Course of Action and Priorities (23-30)**" for each week starting from 7 May 2007.

Session I: Current Status and Pressure

Moderators: Dr. Arun B. Shrestha and Mr. Samjwal R. Bajracharya

Main Contributors: Adam Liddle (UK), Anil K. Raut (Nepal), B. K. Dalit (Nepal), G. Prasad Babu (India), Gehendra B. Gurung (Nepal), Harshvanti Bisht (India), John M. Reynolds (UK), Keshav K. Sharma (Nepal), Krishna Roka (USA), Laxman Belbase (Nepal), Madan Koirala (USA), Maneesha Rajbhandari (Nepal), Narayan Chaulagain (Nepal), Narayan Dhital (Canada), Netra P. Osti (Nepal), Parveen K. Chhetri (Nepal), R. Sreedhar (India), Rabin Sharma (Nepal), Rijan K. Kayastha (Nepal), Ripendra Awal (Japan), Saima Siddiqui (Pakistan), Sudeep Devkota (Nepal), Susheel Dangol (Nepal), Tek J. Mahat (Nepal), Ukesh R. Bhujju (Nepal), Vibek R. Maurya (Nepal), Vimal Khawas (India), Vishwambhar P. Sati (India)

Comments:

Gehendra Gurung urged the scientific communities to focus on immediate actions for adaptation rather than making future projections. He added, there have been considerable impacts of climate change experienced in Nepal including glacier melt and snowline retreat and the adaptation and coping measures have become urgent. **Adam Liddle** showed interest on snow melt and glacier retreat and the effects on land-use and livelihoods in downstream communities of North West Nepal.

R. Sreedhar questioned for clarity on what is caused locally and what is contributed by the global process? He questioned on reliability of witnessing extreme weather events and microclimatic variations which are not well recorded to understand the trends. He further added no coping measures can be adopted without having sufficient hydro-meteorological information.

Vimal Khawas referring articles from Times of India, MRD etc. urged scientific community not to overestimate degree of glacier related hazards. He wrote “scientists need to be more honest about the uncertainties surrounding climate change prediction to avoid losing public trust. Once we began to exaggerate the science in either direction the debate gets out of control”. He also pointed out the case of Upper Indus Basin, where in contrary to the other parts of the Himalaya, glacier is advancing. **Narayan Dhital** presented melting of glaciers, vertical shifting of vegetation and change in timing, intensity and duration of monsoon as major climate change indicators, and adjusting seasonal calendar of people with the changed monsoon scenario, lining up people with respect to change in monsoon pattern, gathering evidences of species (flora and fauna) responses to climate change, long term planning to curb glacier melt and adopting low carbon practices in daily life as major challenges. He proposed to live less carbon emitting life and advocated to benefit from the provisions in the Kyoto Protocol.

Madan Koirala proposed to setup monitoring mechanisms for the mountain communities, realising the mountain specificities (mainly fragility and marginality). He proposed to internalise Indigenous and Traditional Ecological Knowledge (TEK) in the modern science to perfect those monitoring systems. Bioclimatic factors may also give better results... he added.

Harshvanti Bisht informed about her project on eco-conservation and plantation of Bhojpatra (Birch) in Bhojbasa area (altitude 12500 ft.) to investigate adjustment measures in changing scenarios of water supply, agriculture, horticulture and socio-economic conditions and anticipated it as a biggest problem of the highlanders. **Krishna Roka** showed his interest and posted queries regarding past similar studies.

Tek J. Mahat referring an article by Cameron Wake presented glacial environment as a barometer of climate change. He wrote the fluctuations of past and present glaciers serve as a valuable recorder of change within the climatic system. Glaciers provide an unique medium for helping unlock the secrets of our complex climate system. The glacier ice and moraine dams are relatively unstable and occasionally burst, unleashing cataclysmic floods. He reminded Dig Tso GLOF occurred on 4 August 1985 resulting to debris up to 15m high down the BhoteKoshi Valley and causing loss of life and property in a large magnitude. He worried if the glacial retreat continues over long term; the amount of melt

water will decrease resulting to diminishing river flows and wide-spreading acute water shortages. In next response, he informed that there have been more than 15 GLOFs in Nepal occurring at a frequency of one every two to five years, according to the Department of Hydrology and Meteorology. Lack of coordination and information sharing between researchers and institutions is leading to inadequate documentation and archiving. He warned outburst flood would endanger thousands of lives and cost millions of dollars in economic losses. **Rijan B. Kayastha** presented his research finding in Langtang and Lirung Khola basins, which have received more discharge after 1995 considerably as air temperature increased although the precipitation amount did not change much. He concluded it as an implication of depletion of snow and ice in both the basins.

Vishwambhar P. Sati informed that the Garhwal Himalaya experienced a sudden heavy rainfall in mid-February 2007. A similar event was also experienced in 1993 when it received unexpected snowfall. He introduced findings of a recent research showing glacier retreat in “Gomukh”, the origin of Ganges, putting 1.2 billion people in danger, dependent to the Ganges basin. **Vimal Khawas**, **Tek J. Mahat** and **B. K. Dalit** reported similar examples from India and Nepal respectively.

Vishwambhar P. Sati reported the oak forest being invaded by the pine forests (between 1000 to 1600 m) in most of the areas particularly in the south facing slopes. This impact can be noticed in Chakrauta area (Tons valley), Pauri district (Nayar valley), Rudraprayag district (Mandakini valley), Chamoli district (Alaknanda, Nandakini, and Pindar valleys). Many sources of water, as the springs, have dried up due to disappearance of oak trees in many areas because of invasion of pine trees. He added, the impact can also be observed from the fact that musk deers are disappeared from the Nandadevi wild life sanctuary.

John M. Reynolds highlighted the methodological aspects of the glacial hazard assessment in the Himalayas and Andes in order to be able to apply objective criteria rather than the emotive and subjective criteria. He urged the researchers to reassess past studies based on more scientific tools and approaches. He suggested the present discourse to be more focused on “tangible issues rather than emotive ones” in his language.

Vimal Khawas visualised the picture of an adverse bearing on interstate and intrastate disputes in Asia over water issues. He worried about possible future disputes over territories that are either the original source of water or through which major rivers flow, such as Tibet and Jammu and Kashmir. He added extreme water events (acute shortage and flooding etc.) may displace a large number of people creating a problem of environmental refugees. Climate change indeed could imperil the very survival of Bangladesh, a largely delta land that ranks as the world's most densely-populated country with the exception of island-nations and city-states. It could prompt millions of Han Chinese to move from low-lying coastal areas to the sparsely-populated regions of ethnic minorities in the southwest and west. The human security is likely to be the main casualty of climate change. Economic disparities and loss of employment opportunities in agriculture and other global warming hit sector may worsen the situation. Given that at best it can be slowed but not stopped, climate change needs to be elevated from the current scientific-firmament discourse to a national-security issue with particular emphasis on human security. **Madan** agreeing **Vimal** worried about Internally Displaced People (IDP) across the region.

Sudeep Devkota referring the research by W. Schlesinger at Duke University, USA wrote that CO₂ sink demand can easily outweigh the carrying capacity of nature (as tree plantation and ocean sink are referred). He proposed curbing pollution at source as the only sustainable option to control CO₂ emission.

Netra P. Osti and **Keshav Sharma** gave a picture of Methane and other GHG emissions from animal farms and agricultural lands. **Rabin Sharma** criticized the figures given by them and claimed that plants may contribute up to 40% in the total methane emission was highly controversial (please note that even if the plants emit that much fraction of methane, they cannot be necessarily attributable to global warming as they have always

been there in the planet; in fact, the author of the Nature paper had to issue a press release after his paper was mistakenly cited worldwide to blame plants for global warming). He wrote mass media in Nepal generally lack a sense to distinguish science from pseudoscience because they lack a science editor who has a rigorous training of scientific research and who knows what a "scientific method" is. Unfortunately, every other person in Nepal is a social activist and or an environmentalist... he added.

Samjwal R. Bajracharya in his moderation note, responding to *Vimal* wrote number of glaciers may increase as it goes through retreat and shrinkage mechanisms, however it should not be concluded that glacier is advancing because total area is observed to be decreasing.

Arun B. Shrestha in his moderation note, responding to *Sreedhar* and *Vimal* wrote glacial mass balance is more negative in the Himalayas compared to other glaciated regions of the world according to the compilation of global mass balance studies by Dyurgerov and Meier (2005). Based on these studies some scientist and many media suggest that the Himalayan glacier will in some decades vanish. Considering the complexity of the glacial environment and its interaction with different climatic variables, the forum has not found enough evidence to support such ideas and suggests the readers to take such suggestions with caution. Although spatially limited there are some evidences of glacial advances. High altitude glaciers in the Karakoram have been advancing in recent decades (Hewitt, 2005). Due to lack of high altitude observatories there is not much information on the climatic trends in the region and the glacial advance could be redistribution of ice-mass as a response to change in thermal regime. The Karakoram evidence does support the necessity to recognize diversity in response of Himalayan glaciers to global climate change. We need a better understanding of future climate change scenarios and its potential impacts in the Himalayan environment. Monitoring and observation has to be strengthened in the region. Local capacity building is a must. Emerging technologies have to be transferred to the region and capacity of local institutions and professionals have to be enhanced in conducting scientific studies. The next step is to prepare adaptation measure for those dangerous lakes and planned implementation of those measures. While, good science can lead to good policies, sound policy formulation can foster scientific research.

Session II: Future Potential Threats and Challenges

Moderators: Dr. Danda P. Adhikary and Mr. Sandeep C. Rai

Main Contributors: Adam Liddle (UK), Arun B. Shrestha (Nepal), Danda P. Adhikary (Nepal), Gian L. Nicolay (Ethiopia), Krishna Roka (USA), Laxman Belbase (Nepal), Narpat S. Jodha (Nepal), Ngamindra Dahal (Nepal), Puneet Kumar (India), Ripendra Awal (Japan), Sandeep C. Rai (Nepal), Susheel Dangol (Nepal), Tek J. Mahat (Nepal)

Comments:

Tek J. Mahat referring a recent article by National Wildlife Federation on "How Does Global Warming Affect Wildlife?" started a debate on climate change stress on wildlife and presented global warming as the most dangerous threat to the future of wildlife. He reported Adelie Penguins, Caribou, Monarch Butterflies, Migratory Songbirds, Polar Bears, Trout, Coral Reefs and Arctic Foxes are at verge of extinction due to global warming. He urged the regional experts to focus on impact of climate change at ecosystem, species and genetic level and requested to come up with reliable inventories. However he criticized the extremist approach of conservation writing it has become a "fashion" and "means of popularity" to write or speak on climate change. Some environment extremists are also trying interpreting climate change as the biggest threat to human civilization, even bigger than the terrorism. Referring to recent researches he argued that impact of climate change could be far less than publicized. In contrary to the established fact, the evolutionary pressures of climate change will drive the development of new species and it's already happening and we have to be prepared to benefit from this new dimension of change. Already this year

researchers have announced the discovery of a bunch of new species: 6 types of bats, 15 soft corals, thousands of mollusks and 20 sharks and rays, to name a few. If a report issued in 2006 by the Census of Marine Life conducted by more than 2,000 scientists in 80 countries is any indicator, we will see a bumper crop of new animals in the years ahead, too. He urged the scientific communities to quantify the impact of climate change before making projections in hunch and argued synchronization of technological advancements can overcome some of the problems identified till now.

Adam Liddle recommended "The Sixth Extinction" by Richard Leakey, a book offering some thought-provoking reading on 'The Big Five' and the next extinction cycle, for those interested.

Puneet Kumar gave a brief introduction of biodiversity in the Indian cold deserts. He reported that many medicinal and rare plants are disappearing due to unsustainable harvesting practices and warming planet. He shared his observation on change in precipitation pattern in Lahaul Spiti in the northern Himalayas.

Tek J. Mahat citing an article by Michael McCarthy brought out climate change impact on the earth's ability to soak up the GHGs and informed that it is beginning to fail because of rising temperatures, in a long-feared sign of "positive feedback". He added human society has hugely benefited from the earth's natural carbon absorption facility, which means oceans and forests take up roughly half of the CO₂ pumped into the atmosphere. Research studies lead by a team of University of East Anglia shows that Southern Ocean, the earth's biggest carbon sink, accounting for about 15 per cent of the total absorption potential, has become effectively CO₂-saturated and climate change itself is weakening the saturation potential in this area. As a result, atmospheric CO₂ levels may rise faster and bring about rising temperatures more quickly than previously anticipated.

Sandeep C. Rai referencing a NASA research in Antarctica advanced the snow and glacier melt debate in the Himalayas to a new level. *Ripendra* after analysing the river flow data of Trishuli argued that there may be increasing contribution of snow melt due to global warming since the analysis shows increasing runoff in the river. However, *Arun* clarified that there is no such indication in case of Trishuli and shared his research findings. He questioned that the analysis may be flawed and requested *Ripendra* to use the relevant and updated data from DHM or contact them in person. *Tek* worried about the loss of aquatic flora and fauna writing "the flooding events will scour the species that live in the river areas" according to Dr. Lara Hansen, Chief Scientist, WWF Climate Change Programme. According to her High-altitude plants and animals that are highly dependent on the glacial melt during the non-rainy season also will be affected and as climate change intensifies, humans growing desperate for year-round water are likely to pay less attention to the needs of protecting biodiversity. *Laxman* linked the issue of water scarcity due to various reasons including glacier melt and change in monsoon pattern with economy of the himalayan countries and urged to work through partnership when the issue are transboundary in nature. *Gian* and *Narpat* also highlighted the role of mutual support in dealing with this kind of issues. *Gian* further added that regional and global organisations like UNEP and ICIMOD should play key role to ensure sustainability of water resources in the region.

Laxman Belbase admitted fact that the impact of climate change will be non-uniform in various parts of the world and developing countries are most likely to be suffered. According to Dr. G. H. P. Dharmarathne, Director, Centre for Climate Change Studies (CCCS) of the Department of Meteorology, Sri Lanka, the poorer countries, which were less able to adapt to the changes would suffer the worst from the unavoidable impacts which would be particularly severe in Africa, Asia, and Latin America. The developed countries contribute the most to global warming. He pointed out that developing countries like Sri Lanka could not afford to control or altogether stop the use of fossil fuels, "but we can explore measures to adopt and mitigate adverse effects of climate change". According to Dr. B.V.R. Punyawardane of the Natural Resources Management Centre of the Department of

Agriculture, Sri Lanka, the both quality and the quantity of the crop would decrease due to global warming and the consequent changes in the rainfall and availability of water. According to Dr. Nihal Abeysinghe there is a clear link between the local climate and occurrence or the severity of some diseases. Certain serious diseases appear only in warm areas and also the warm temperatures can increase air and water pollution. Since these effects are unavoidable adaptation is the only solution.

Ngamindra Dahal advocated to look the climate change induced issues in a wider level. He highlighted changes in temperature, wind and precipitation, weather hazards, vegetation, water supply and housing, agriculture and lifestyle/ business as major areas to be considered for climate change research. He gave a brief account of climate change impacts in the ACAP region of Nepal, witnessing impacts of climate change making local communities' hardships further worse. *Tek* proposed to consider community and social vulnerability for climate related researches. *Krishna* joined the issue with couple of examples.

Laxman Belbase highlighted the petition filed by "Pro Public" in UNESCO -World Heritage Committee (WHC) and informed that there is little effort from Nepal's side to place Sagarmatha National Park in the list of vulnerable World Heritage Sites He added...WHC has paid more attention and assured to discuss the agenda at their general assembly. He urged for global commitment the sustainability of those precious resources.

Danda P. Adhikary and Sandeep C. Rai in their moderation note wrote that biodiversity loss and species extension could easily outweigh the emergence of new species, that's why we need to worry about vertical shifting of some species responding to global warming. They argued that scientific communities should not generalize serious issues like biodiversity loss with respect to rare examples. A small number of new species cannot compliment a large number species that are at risk of extinction. They also worried about coastal countries mainly as a result of glacier melting as the sea level rises their will be big problem. *Sandeep* claimed that water scarcity will be biggest problem in near future outweighing national economy in many parts of the world. *Sandeep* emphasized to focus on post 2012 negotiations related to CDM to attain a significant cutoff in GHG emission.

Narpat S. Jodha stated that global warming debate has created more noise and scare rather than positive pathways. He said the situation in terms of solid data and models is much better today but regional context of the future changes is continues to be uncertain. Adaptation to warming is yet another big issue. By accepting this, we seriously undermine the human potential to adapt to the change. *Gian* agreeing with *Narpat* urged for local level initiatives, including capacity development at community level to tackle the future problems. Both *Narpat* and *Gian* agreed that, at least the positive development of climate change campaign is that it has increased the awareness at different level and that can be very useful when developing adaptation plans.

Session III: Future Course of Action and Priorities

Moderators: Dr. Madan Koirala and Mr. Ngamindra Dahal

Main Contributors:

Basanta Shrestha (Nepal), Bhubaneswor Dhakal (Nepal), Birendra Bajracharya (Nepal), Chu Duo (TAR), Deoraj Gurung (Bhutan), G. Philip (India), Gian L. Nicolay (Ethiopia), Hamid Ch. (Pakistan), John M. Reynolds (UK), Laxman Belbase (Nepal), M. P. Shah (India), Megh R. Dhital (Nepal), Narpat S. Jodha (Nepal), Ngamindra Dahal (Nepal), Parveen Chhetri (Nepal), Pradeep K. Mool (Nepal), R. Sreedhar (India), Rabin Sharma (Nepal), Rajiv M. Bhagat (India), Rakhshan Roohi (Pakistan), Samjwal R. Bajracharya (Nepal), Sharad P. Joshi (Nepal), Tao Che (China), Tek J. Mahat (Nepal), Ukesh R. Bhuju (Nepal), Vaibhav Kaila (India), Vimal Khawas (India)

Comments:

Bhubaneswor Dhakal discussed on climate change prediction methods and vulnerability of mountain people, especially in the Himalayan Context. *Parveen* responding him, highlighted the silent features of Dendrochronology and presented it as a most

scientific way for climate change study. *Tek* floated the issue of vulnerability of indigenous people around the world due to the climate change citing John Scott Secretariat of the CBD.

John M. Reynolds, along with reference to his review article published in Mountain Research and Development in 2004, attempted to draw clarification on glacier inventory and hazard mapping in the region. *Samjwal* and *Pradeep* mentioned various aspects of glacier and glacial lake inventory in the region clarifying John on ICIMOD's inventory published in 2001. *Sharad* highlighted other aspects of the inventory report. *Basanta* and *Birendra* discussed on lack of remote sensing images and other challenges during development of those inventory reports. *John* emphasized on use of globally accepted standard.

Chu Duo, Deoraj Gurung, G. Philip, Hamid Ch., Megh R. Dhital, Rajiv M. Bhagat, Rabin Sharma, Rakhshan Roohi, Tao Che and Vaibhav Kaila joined the discussion on glacier inventory. They appreciated the inventory work carried out by ICIMOD despite of limited sources of information and referred it as a milestone in the area of glacier studies in the region. They also thanked ICIMOD GLOF team for providing their technical assistance to carry out similar studies in India, China, Pakistan and Bhutan. However, regional experts were criticized for complementing peer reviewed journal articles by publishing books only. **Rabin Sharma** urged the regional experts to present their research works through the journals that have wider access, scrutiny and validity. All the commentators urged the inventory team to update their report published in 2001.

R. Sreedhar raised the issue whether there were more dependable ways of predicting weather patterns in every cropping season and also raised queries on the extreme events especially cloud-bursts, hailstorms. *Ngamindra* responding Sreedhar expressed perceptions of scientists and development practitioners in the field of agriculture, forestry and water would help streamline the discussions. *Tek* joined the conversation with a clipping of German Environment Minister Sigmar Gabriel, who cited that about 150 species disappear every day in the G8 meeting. *Sunita Narain's* clipping "No more Kindergarten approach to climate" published in Down to Earth, forwarded by *Tek* drew the attention of the participants. *Vimal* was of the opinion that the human dimension has inadequately looked into the context of the debate of climate change. *Narpat* joined the *Vimal's* view with adaptation practices done by humans in context to livelihood strategies such as planting trees, which in turn has contributed positively to climate change. Article by *Ngamindra* entitled "Implications of Climate Change on Biodiversity in Nepal: Some Observations and Opportunities" contributed the debate in an interface. *Tek* providing sufficient evidences of adaptation measures to tackle climate change urged the global community to work through partnership. *Tek* proposed "National Environmental Happiness Index (NEHI)" for better assessment of environment of a country and to allocate available resources equitably for wise and sustainable planning.

Conclusions and Resolutions

- ◆ Debate on global warming (glacier melting included) has diverse views and perspectives. They help the process of reaching the better truth and should be allowed.
- ◆ More scientific objectivity focused work in diverse situations needs higher priority.
- ◆ Adaptation focused research addressed to specific contexts should also get high priority.
- ◆ The present E-conference has demonstrated the utility and need as well as has imparted considerable confidence to the organizers to repeat the E-mail based debate on other related subject.

- From concluding remarks by Dr. N. S. Jodha

For more information;

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