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## Climate Change and Geoenvironmental Concerns in the Mountains

– D. P. Adhikari, adhikaridp@ntc.net.np

**G**lobal climate change – driven largely by human-induced warming of greenhouse gases (GHG) – is a growing threat to humanity.

The world experienced a surface temperature rise of 0.6°C on average during the 20th century, and the temperature by year 2100 is projected to go as high as 6.4°C relative to 1990 if GHG emissions are not reduced (IPCC 2007). But time has shown that given the dependence of global economic systems on fossil fuels, and the time required for new technologies that reduce or replace fossil fuels, to integrate into the global marketplace, significant reduction in GHG emissions is unlikely to occur soon enough to avoid climate impacts. Significant harm from observed climate change on the environment and on society is already occurring worldwide, and more severe and widespread impacts lie ahead. This

article focuses on observed and projected climate change impacts on the geoenvironment of the Nepal Himalaya.

The average maximum temperature in Nepal between 1977 and 1999 has increased by 0.9°C, at a rate of 0.03°C to 0.12°C per year (Shrestha et al. 1999), and is estimated to have gone even higher since then. This is one of the highest registered rates of temperature rise in the world. The observed trend of rising temperature in Nepal is challenging the IPCC projections, as it seems that land areas will warm more rapidly than the global average. Associated with temperature change, monsoon precipitation patterns have also undergone changes, with decreasing rainy days and increasing high-intensity rainfall – extreme events resulting in intense and frequent water-induced disasters such as landslides,



An example of debris flow deposit in Phedigau, Kulekhani catchment area as a result of extreme precipitation in July 1993.

Dr. Adhikari is a Lecturer at Tribhuvan University in Kathmandu, Nepal. He is also the General Secretary of the Nepal Geological Society.

D.P. Adhikari

## *Coordinator's Notes*

The Asia Pacific Mountain Network (APMN) is pleased to bring you the 2007 winter issue of the Bulletin. This time the Bulletin includes syntheses of two exciting discussions. The first on Conservation in the Garhwal Himalayas touched on the issues of parks/people conflicts, and holistic approaches to conservation to resolve them. The second revolved around issues related to education for sustainable development and ways of providing education to nomadic peoples as an input to the 4th International Conference on Environmental Education. There was not enough space to include another lively discussion on glacial grafting. These discussion threads illustrate the vibrant interests of our network members, and the potential for APMN as a platform for discussing critical and emerging themes. We hope you will find the other articles in this issue equally interesting.

Our network continues to grow. As we go to press, we are a network of 176 organisational and 1196 individual members from 38 countries, and growing daily. In the coming year we will look at different ways of broadening and extending the network, as well as providing a platform for more focused groups.

APMN is entering an exciting new phase as an integral component of a concerted approach to bring the mountain agenda to the forefront of international discussions and policy. With the continued support of the Swiss Agency for Development and Cooperation (SDC), APMN is strengthening its relationship with worldwide Mountain Forum and the Mountain Partnership. We will tell you more about the synergies among these organisations in the next issue.

We welcome your feedback and comments, and suggestions as to how we can serve you, the members, better. Make use of your Forum for passing on news and information, and starting discussions, or send an article for the next bulletin. We look forward to hearing from you.

A. Beatrice Murray

debris flows, and floods (Adhikari 2004). Such changes can be linked to climate change or, more popularly, to global warming. Extreme events often account for a larger percentage of measured precipitation even though the total amount of rain in a given location may not have been altered.

The Himalaya was formed from the collision of the Indian and Eurasian plates around 50 million years ago. The Indian plate is moving northward against the more stable Tibetan block at an average rate of approximately 5 cm per year, even after the collision. The continued push related to such movement has made the Himalaya a belt of uplift; the present uplift rate is a few mm to nearly 1 cm per year (Molnar and Tapponnier 1975). Physiographically, 83% of Nepal's territory is mountainous terrain and the wide range in altitudinal variation along its width gives rise to a steep and rugged topography and extreme relief. As it lies in the South Asian monsoon regime, 70-93% of Nepal's annual precipitation occurs in the four months from June to September. Steep and unstable slopes, rugged terrain, active geodynamic processes, and intense monsoon rains make the Himalaya an active and fragile mountain range. As the nature of the Himalaya suggests, landslides and debris flows and floods are the main types of water-induced hazards in the region and in Nepal. These hazards wipe out entire villages, wash out roads, bridges, canals, and hydropower plants, and damage hectares of valuable agricultural land during the monsoon season. Besides substantial economic losses, more than 320 people on average lose their lives in the Nepal Himalaya alone. Other losses from these hazards are on a rise every year.

Many factors trigger debris mass movement or debris flows. Among the most common triggers in the Himalaya are prolonged or heavy monsoon rains. Rainfall can lead to mass movement of debris by reducing the internal or binding strength of soil and other

materials. through three different mechanisms. The saturation of soil materials increases the weight of slope materials and creates greater gravitational force. Saturation of soil materials can reduce the cohesive bond of individual soil particles, and water can serve as a lubricant along the interface between soil and rock, and along the weakness zones of rocks, such as joints, cracks, and fault planes. The first two mechanisms often act in combination.

Rainfall intensity and duration thresholds for triggering landslides have been widely identified in many different climates and geological settings. Caine and Mool (1982) estimate a threshold rain of 100 mm day<sup>-1</sup> to trigger a landslide and lead to a debris flow such as had happened in the Kolphu Khola drainage basin area, central Nepal in 1980. The intensity and duration of rainfall that can initiate a landslide depends on many factors. However, most landslides and debris flows reported in the Nepal Himalaya are either associated with intense or sustained monsoon precipitation (Dhital 2003, Adhikari and Koshimizu 2005). The landslides and debris flows of Lele (1981), Kulekhani (1993), Larcha (1996), Syangja and Butwal (1998), Khotang, Ramechhap, Bhojpur, and Taplejung (2003), and Chitwan (2003 and 2006), are some examples of such events. In recent decades, almost no year passed without disastrous mass movements such as landslides, debris flows, and floods. The intense precipitation (540 mm in 24 hours) on 19-20 July 1993 in the Kulekhani catchment area, central Nepal, triggered 300 landslides of various sizes, and many of them gathered into disastrous debris flows which killed 65 people.

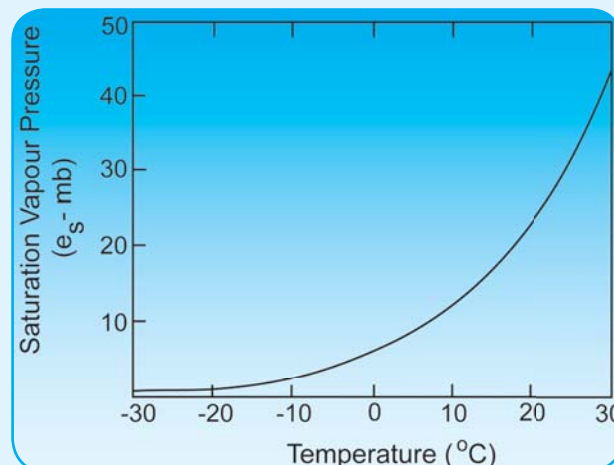
The South Asian monsoon is one of the most important and influential phenomena of the earth's climate system. The modern large-scale, time-averaged seasonal variations in the South Asian monsoon system are fairly





Debris mass at the Narayangarh-Mugling Highway obstructs traffic.

D.P. Adhikari



The Clausius-Clapeyron relationship illustrates saturation vapour pressure as a function of temperature.

well understood and are linked to the greater heat capacity of the ocean relative to the surrounding land masses. During summer in the Northern Hemisphere, the Tibetan Plateau warms rapidly relative to the Indian Ocean. The resulting low pressure over Asia and higher pressure over the ocean gives rise to the strong low-level atmospheric pressure gradient that, in turn, generates the south-west monsoon from the Indian Ocean. In years of low snowfall, the Tibetan Plateau is able to warm earlier and generate stronger monsoonal circulation. Deep snow and associated influences on albedo (reflected light or radiation) and soil hydrology delay and weaken the monsoon (Overpeck and Cole 2007). In the winter, the continent cools relative to the ocean, the pressure gradient is completely reversed, and the dominant flow across the Arabian Sea becomes northeasterly and, therefore, the South Asian region receives little precipitation.

Applying the Clausius-Clapeyron Law (see diagram) it is clear that the saturation vapour pressure (specific humidity) in the atmosphere is a function of air temperature, and the more important property is that it increases exponentially with temperature, causing the amount of water vapour to rise even higher at higher temperatures. Vapour pressure is the pressure exerted by the water vapour

and is a measure of how much vapour is in the atmosphere. Saturated vapour pressure is the maximum amount of vapour the air can hold, and specific humidity is the ratio of the mass of vapour in a certain volume to the total mass of air and vapour in the same volume. At typical earth temperatures, a 1% change in temperature of  $\sim 3^{\circ}\text{C}$  implies about a  $\sim 20\%$  change in saturation vapour pressure. Around  $20^{\circ}\text{C}$ , the increase is about 6% for every degree Celsius. Based on this physical law, it is anticipated that atmospheric warming will lead to more rainfall. The amount of water potentially available for rainfall increases because warmer air is capable of holding more moisture. The enhanced convective rainfall in the tropics can be taken as such an example where the relative humidity is high compared to middle latitudes.

Arguments based on physical phenomena clearly indicate that global warming will cause an increase of evaporation from the ocean. A warmer atmosphere can carry more moisture, which can lead to larger amounts of precipitable water. Global warming will also induce higher temperature differences between land and sea surfaces, causing an increased transport of precipitable water to the continents, and an increase in frequency of intense rainfall. Recent results from global coupled models generally agree with

these scenarios. The global coupled ocean-atmosphere climate model of the National Centre for Atmospheric Research produces greater mean precipitation in the South Asian summer monsoon region (Lal et al. 1998). The model predicts a total precipitation increase of approximately 20% with the doubling of the present  $\text{CO}_2$  level. The expected increase in monsoon rainfall is therefore largely due to increased water content in the atmosphere as suggested by the Clausius-Clapeyron Law. It is also supported by the observed phenomenon that atmospheric water vapour concentrations are rising in the lower and upper troposphere (IPCC 2007). The model also predicts a greater number of heavy rainfall days during the summer monsoon period, and increased interannual variability. The higher percentage increase in precipitation is likely to occur in mid to high latitudes and higher altitudes. This explanation is supported by terrestrial paleoclimate records that the South Asian monsoon during the last glacial period was significantly weaker than at present, and was abruptly strengthened during the beginning of Holocene Period around 12,000 years ago (Overpeck and Cole 2007).

Landslide and debris flow losses in the Himalayas are likely to continue increasing even without climate change, as growing population, combined with the need to protect natural and

# Interview

agricultural areas, presses human developments ever closer to unstable mountain slopes. In the face of active geodynamic processes and the disaster-prone nature of the Himalayas, more intense and frequent precipitation events are expected because of climate change, which would increase the potential for more landslide and debris flow events in mountainous regions and floods in the lowlands. The geoenvironmental impacts are likely to be felt hardest in the Nepal Himalaya. The only way to reduce such losses is to develop a better understanding of landslide and debris flow processes, more reliable techniques for predicting their potential effects, and the design of remedial or protective measures. Assessing the impacts and vulnerability of human and natural systems to climate change and exploring appropriate adaptation options are the essential steps humanity can take to reduce vulnerability to climate-induced geoenvironmental impacts.

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## Interview

### Mr. Mahabir Pun, Chairman of E-network Research and Development



Tek Jung Mahat

**M**ahabir Pun, 52, a Nepali citizen, is this year's 2007 Magsaysay awardee for community leadership for his innovative application of wireless computer technology to connect his remote native village, Nangi, in Nepal, to the global village. The Magsaysay Award, the Asian equivalent of the Nobel prize, is given every year to Asians achieving distinction in the fields of government service; public service; community leadership; journalism, literature and creative communication arts; peace and international understanding; and emergent leadership.

Returning to his native Nangi village after receiving his Master's degree in Education at the University of Nebraska in Kearney, Pun founded the Himanchal Education Foundation. Associating with several organisations working on ICT for rural development, he worked to establish wireless networks in rural Nepal, for which he gained the Magsaysay award of distinction. *APMN* in this interview discusses his ongoing projects and the potentials and possibilities of ICT for rural development in the Nepal Himalayas.

**Q. How do you feel after winning the Ramon Magsaysay Award for your contribution to rural community development?**

**A.** I have never worked for awards. However, I am very happy to have been awarded (this distinction) and have realised that I have made Nepalese media and other people happier than me, highlighting the importance of my work and the award.

**Q. Tell us about your ongoing projects. What are your future plans regarding wireless technology in Nepal?**

**A.** There are many projects in progress. We are expanding our services upon request from communities, the government, and other agencies. Now we are connecting the Internet to some villages in Mawanpur district and planning to provide tele-medicine and tele-education services. Rato Bangla School planned to conduct training for teachers and tele-education to schools in the rural areas of Mawanpur. We are also working with the Kathmandu Model Hospital to expand tele-medicine services to Dolkha district. Upon request from Winrock International, we are currently linking the rural southern villages of Palpa district to the Internet. We are also expanding our earlier work in Myagdi to more villages, which will be provided with tele-education and tele-medicine services. We are also connecting the service to four districts between Kathmandu and Pokhara. Apart from this, we are working with Madan Puruskar Pustakalaya (a library and not-for-profit institution that is the principal archive of books and periodicals in the Nepali language), to introduce Nepali Windows and Nepalinix, and developing and organising (curriculum) content through the Open Learning Exchange (OLE). (OLE is a worldwide network of 100+ local grassroots organisations [OLE centres] committed to providing universal basic education in their respective nations). Course content in mathematics is being developed for grades 6 and 8 in consultation with the

Ministry of Education. We are also working with the Kathmandu Engineering College to develop video-conferencing applications and with Gandaki Engineering College on some other applications.

**Q. What are some of the major challenges you encountered implementing your projects?**

**A.** When you go to many rural villages, you will see that there are very few trained and qualified teachers. Many schools lack teachers. It is a big challenge to use ICT to promote education in those areas. My interest is to expand the Internet as a means of promoting education. Internet expansion itself has no meaning unless we enable people to use the services that can be made available. When they don't understand English they can't make good use of the Internet and it simply becomes a showpiece.

We have faced a few technical problems in tele-medicine and tele-education and our technical team is responsible for fixing (these) problems. Currently, we have only four paid staff, the rest are all working on a volunteer basis. Financial capability is another challenge to (be able to) upscale and expand services. Since we have a poor literacy rate in mountainous and hilly areas, development of capacity to use ICT services among rural communities is another challenge which cannot be solved overnight. It is a gradual process and needs to be integrated with the country's overall educational system. Lack of coordination among similar organisations is another problem.

**Q. Do you see the possibility of replicating or upscaling your work in Nepal to other remote mountainous regions of Asia and the Pacific?**

**A.** Yes. However, our current activities are in Nepal only. We are doing (our) homework to start a relatively big project in three remote districts in far-western Nepal with support from the National Planning Commission, most

probably in Bajhang, Bajura, and Jumla. Projects in Mawanpur, Dolkha, and others are a few of the examples of replication and upscaling. As we move from hilly areas to the plains we may have some problems with off-line sites. In the plains, we cannot see farther like in hilly areas, and we have to spend more resources in setting up in off-line sites, but in the hilly areas we can easily see peaks from far away and that makes the wireless system easier to connect and also cheaper, as we do not need to invest much in setting up towers. Recently, teams of television programmes arrived from India who are willing to develop video clips of our work in Nepal and planning to broadcast these in India. We are receiving similar requests from media (in other countries).

**Q. What are some of the challenges faced by the mountain community of Nangi, and how has wireless technology helped to address them?**

**A.** The case of Nangi is not much different from other parts of Nepal. I do not know the situation in the far-western hilly districts, where people are facing problems of famine most of the time. In general, most of the mountainous communities have traditional agricultural systems and somehow are able to produce minimum grains to eat and are able to sustain subsistence livelihoods. Not only in mountains but also in other parts of Nepal, the major problem is people do not have jobs or other alternatives for cash income, for which reason they migrate seasonally (and in some cases for many years) to neighbouring countries. It has become an unavoidable option, as people do not have the opportunity to generate income to cover the expenses of basic necessities such as salt and oil. Similarly in the villages, they do not have hospitals, schools, and communication facilities, which add pressure on the overall development of the region. However, these problems are not limited to Nepal or Nepalese mountainous areas.



# Highlights

The contribution of technology in improving livelihoods of rural people is not as easy to measure as it seems. In relatively developed areas, or areas which are closer to markets, technology can make the people aware about market-related information on a variety of products so they can sell their products at best price. Take the case of herbs and other high-value, low-volume products that are common in our mountain regions. Presently, the collectors – the local people – are selling their products at very cheap prices to contractors who are mainly from cities, or at least they do not come from these areas and they resell the products for better prices. It's because the local communities are not aware of the market system and the further processes after they sell the products to the contractors. If we manage to develop a system to inform them about their products and their markets, and market rates, and so on, through application of ICT tools, local communities will benefit more than they are benefiting now, and we can see a

remarkable improvement in income generation in local communities. But this is not equally beneficial for all products and areas. Application of ICT should be supported side by side by roads and other means of transport to markets for the rural goods to be marketed most effectively. For example, Jumla and Humla grow good quality apples and the people are aware of their market value. However, they are still not able to sell their products because of the large investment required, lack of transportation facilities, among others.

## ***Q. How do you see the role of ICT in the transformation of rural communities in next five years?***

**A.** Five years is a long time when talking about technology and its advancement. In the next five years technology will be cheaper and will be easily available to the poor. Today's sophisticated technology will be common and more improved technologies will be available for our use and that can be used for

and by rural communities. When the cost of ICT falls and affordability by local people increases, it will be easier to expand services, and the poorest of the poor can also have access to technology and benefit from it. However, ICT is not magic in itself and cannot transform rural communities drastically. ICT should be promoted side by side with other literacy-related programmes and income generating activities, after which some remarkable changes will occur. One tragedy in our country is (that) many short-term projects are working in the areas of ICT and they do a pilot project in some area and (then) they disappear in a couple of years, and as a result neither do the communities benefit, nor is the technology tested in a more exhaustive way. In such cases, no transformation can be expected (to take place). But in reports they claim big achievements. This should be discouraged for better implementation of ICT projects.



## Mountain Highlights

### **Tsho Rolpa, Seven Years After Mitigation Efforts**

– Arun B. Shrestha\*

**T**sho Rolpa is the most discussed glacial lake in the whole Himalayan region. It is the only glacial lake in the Himalayas where engineering measures have been implemented to reduce the risk of glacial lake outburst floods or GLOFs. The author had an opportunity to visit the lake recently, seven years after implementation of risk reduction measures. Here are some of his observations.

Tsho Rolpa, the largest lake in Nepal, with a surface area of about 1.76 km<sup>2</sup>, is the largest and perhaps most dangerous glacial lake in the Nepal Himalaya. The lake is located in the headwaters of Rolwaling and Tama Kosi valleys, Dolakaha district. Rolwaling is home to some Sherpa settlements, and the Sherpas have been able to preserve

their traditional culture. The lake, with about 100 cu m of water is retained by a 150m high and, at places, only 50m wide terminal moraine largely cored by pre-historic ice which is rapidly melting and degrading the moraine's stability. This is why it has been considered a major GLOF hazard by the Nepalese government and therefore GLOF

mitigation activities have been initiated in the area.

Initially, some siphon pipes were installed at the lake site for test purposes. This technique for lowering lake water levels was found not technically feasible, and lowering the lake level by 20m in phases was then considered. As this involves significant

\* Dr. Arun B. Shrestha is currently Climate Change Specialist at ICIMOD, Kathmandu, Nepal.

engineering effort, requiring time for preparation and substantial funding, an early warning system (EWS) was placed in the meantime with a US\$ 1M fund from the World Bank. The warning system included a high-tech system based on a meteoburst communication system with an array of sensors located just below the lake, and 19 warning stations in 17 villages along the Rolwaling and Tama Kosi rivers, including the powerhouse facilities of the Khimti Hydropower Project. The EWS became operational in June 1998. Soon after its commissioning, the government of Nepal secured funding from the Dutch government for the first phase of lake water lowering, which included a 3m lowering of the water level by constructing an open channel in the terminal moraine. The cost of the project was US\$ 3.1 M. Construction work started in April 1999 and a 3m drawdown in lake level was achieved in June 2000.

After seven years, the engineering structures at Tsho Rolpa are functioning satisfactorily and have required only a small investment to operate and maintain.

A micro-hydro facility was added to the structures, which has made the project site itself self-sustaining in terms of energy supply. While some field studies have been carried out after mitigation work was completed, a comprehensive reassessment of the GLOF hazard is still pending. There has not been much initiative from the Nepalese government and donors to reassess the hazard of

further lowering the lake level. The 3m lake drawdown has averted the immediate risk of a GLOF from the Tsho Rolpa Lake. However, the lake is located in a highly dynamic environment, with lateral and terminal moraines undergoing constant changes, and the parent glacier, Trakarding, is experiencing continued and rapid retreat. The 3m lowering has only bought time for Tsho Rolpa and is not a permanent solution. Is it still necessary to lower the lake by another 17m? This can be answered only after a reassessment of the GLOF hazard presented by the lake, which will include detailed field investigations. Visual inspection suggests that the lake surroundings are undergoing rapid changes. The slumping and subsidence of lateral and end moraines continue due to melting of cored dead ice. There are now at least two more islands on the lake. These islands were earlier connected to the shore, but are now isolated as the land in between has submerged under water.

Without measurement, it is not possible to estimate the rate at which the moraines are subsiding, although it not difficult to make a guess that the rates of decline are quite high. A reassessment in the near future of the GLOF hazard it presents seems important.

We found the EWS in poor condition. We gathered that the main reason is that funds have not been secured for the operation and maintenance of the EWS. Without proper maintenance the system has gradually deteriorated to its present non-functional state. Earlier, a small flood damaged the GLOF sensor, and gradually, it has been reported, equipment from the warning stations is being stolen. Solar panels and batteries were the first to disappear. Perhaps a major problem is that the villagers do not feel ownership of the installations and have little knowledge of the purposes they serve. There had been some interaction with the villagers in



'Instrument Island' in 2000 (top) and in 2007 (below). The island was connected to the shore and an automatic weather station was installed there, hence the island's name. The crescent shaped land is now completely submerged.

the early days of the EWS installation, and some training provided on how they should react if the warning siren goes off. However, there were no follow up interactions and people gradually forgot about the system, that was actually put in place there to save their lives. During our visit we talked to local people in Beding and Naa, the two villages closest to the lake.

We found that all well-to-do people, particularly men of the village, now reside in Kathmandu and only the elderly and women remain. To our surprise, many of the people we spoke to did not find the EWS of any use. Several thought Tsho Rolpa was not dangerous at all! Three people are permanently deputed to look after the mitigation structures at the lake site. They are in constant contact with the villagers and, over time, have developed a good relationship with them. The VHF radio at the lake site has been the only means of communication for the villagers, particularly during emergencies. This has helped develop a close relationship between the project and the people. In contrast, the EWS,



The gated open channel constructed in 2000 to lower the lake water levels

although run by the same organisation, has been left unattended and isolated from the community.

In conclusion, the experience of Tsho Rolpa has been a great asset for advanced mitigation planning. It has shown that it is not only the complexity of the structures or the equipment that guarantees the success or failure of systems in place like in Tsho Rolpa. A

good relationship with the people and acceptance by them are important to sustain the effort. This is an important lesson to consider in future initiatives on GLOF mitigation.



Arun B. Shrestha

An elderly woman of Rolwaling Valley

## APMN News

### **P**roject Updates, Asia Pacific Mountain Network, Mountain Partnership Secretariat and Mountain Forum Secretariate Collaboration

APMN is carrying out three tasks for the Mountain Partnership Secretariat (MPS) facilitated by the Mountain Forum Secretariat (MFS). Under the 'Broadband Communication Study', APMN and the Forum for Information Technology-Nepal conducted a survey of the potential of broadband communication to contribute to the socioeconomic development of low connectivity areas of the Nepal Himalaya. A workshop was organised on 25 May 2007 to discuss the findings, and a final report is being written. The second task is a 'Communication Needs Assessment in Central Asia', which has been carried out in Kyrgyzstan and Tajikistan using a mix of survey and consultative approaches. In the final project, APMN is developing communication tools to support the 'Biodiversity Conservation Initiative' of the Mountain Partnership, with a focus in the first instance on the Mountain Twinning Programme between Gran Paradiso National Park in Italy, and Sagarmatha National Park in Nepal.

### **Supporting a Pre-conference Dialogue on Education for Sustainable Development**

With assistance from the Mountain Forum Secretariat, APMN supported an on-line pre-conference dialogue to initiate discussions on 'Education for Sustainable Development' for the '4th International Conference on Environmental Education', held in Ahmedabad, India from 26-28 November 2007. The conference was organised by the Government of India, with UNESCO and UNEP as co-sponsors, and hosted by the Centre for Environment Education. Mr Tek Jung Mahat of APMN presented the summary of the e-discussion at the conference (<http://www.tbilisiplus30.org/index.html>).

### **APMN Participation in Regional and Local Events**

Dr. A. Beatrice Murray, APMN Coordinator, participated in the Global Development Network 'Knowledge Management for Organizational Capacity South Asia Region (SAR) Brainstorming Session' held in New Delhi, India from 5-7 December.

APMN and ICIMOD participated in the '4th International Conference on Environmental Education' held in Ahmedabad, India from 26-28

November 2007. Mr Tek Jung Mahat, APMN Interim Node Manager, also participated in a training course on 'ICT for Education Leaders: From Vision to Reality', organised by the World Bank Institute, the Ministry of Education and Human Resources Development, Korea, and the Korea Education and Research Information Services in Seoul from 12-16 November 2007. APMN also took part in 'National Conservation Day 2007' celebrations in Kathmandu, Nepal on 23 September, jointly organised by ICIMOD, WWF Nepal, IUCN – The World Conservation Union, the National Trust for Nature Conservation, Wildlife Conservation Nepal, The Mountain Institute, and Wildlife Watch Group; in the 4th Asia Regional Conservation Forum 2007 in Kathmandu; and in a one-day hike and interaction programme organised by Gorkha Tourism and the Nepal Travel and Media Association on 11 December to celebrate 'International Mountain Day 2007' in Nepal.

Publicity materials on APMN and Mountain Forum were distributed during these events and other events attended by ICIMOD staff. These events were networking opportunities and participants were encouraged to join the APMN network.





## E-discussions

These discussions took place on the e-list and are summarised here for broader sharing.

### Conservation in the Garhwal Himalayas

– Tek Jung Mahat, [tmahat@icimod.org](mailto:tmahat@icimod.org)

**Discussants:** Arun Shrivastava, Brian Mac Call, C.S. Silori, K.N. Vajpai, Meher, Priya Singh, Rajesh Patnaik, Rajinder Singh Kishtwaria, Sreedhar, Wolfgang Bayer

The discussion begun with a provocative mail from Priya Singh of the Wildlife Conservation Society questioning the behaviours and attitudes exhibited by people living in the Garhwal Himalayas towards institutions promoting wildlife conservation in the region.

The recognition of 'Nanda Devi National Park' as a world heritage site is a big achievement, but more concerted efforts are still required to promote conservation. The region is the birthplace of the van panchayats; the local women were the initiators of the Chipko movement. In recent years the people of the Niti Valley have been systematically asserting their constitutional rights; they formed an ecotourism board involving all concerned local bodies.\*

The poaching and trade of animal parts, changing land use practices and human-wildlife conflicts, among other issues, are important concerns and affect the region's biodiversity. The threat to conservation from population and environmental pressures is increasing. India has a comprehensive set of environmental laws, and good institutions and a judiciary system, but enforcement, implementation and compliance remain key challenges. Recently, the Ganges and Indus rivers

were included in the top 10 Endangered List of the WWF; directly linked to the state of biodiversity in the region. A discussion participant proposed a more integrated approach to river basin management, especially as the major river basins cross geopolitical boundaries.

Local farmers and farming communities in the mountains have too rarely been involved in setting up wildlife reserves, national parks, and protected areas. The vision of development by governments and by 'outsiders' may not match that of the local communities and their vision of the future. The communities in conservation areas have been calling on the 'experts' and government administrators, to understand what holistic conservation is all about and to seek a change in their attitude towards the affected communities. When local communities have a sense of ownership and tangible benefits from using the natural resources, these resources will be protected. In many cases people have already developed effective mechanisms for protection. When they feel alienated, overexploitation of the resources becomes common. Protection, for example against commercial poaching (often with support from 'outsiders'), is not high on the list of community priorities. Unfortunately, we are not always good at listening to people and gaining their confidence. The 'locals' are often if not always right, and what they know from living close to their surroundings may be decisive in conservation planning.

Transboundary cooperation to check illegal trade and organised systems of harvesting forest products, and livelihood security are among the immediate concerns and priorities. These factors and people's participation need to be considered in the formulation of conservation plans.

### Education for Sustainable Development

– Marianne Heredge,\* [marianne@mtforum.org](mailto:marianne@mtforum.org)

**Discussants:** Aftab Rana, Ali Gohar, Anil Pradhan, Benedicto Q. Sanchez, Bhubaneswor Dhakal, Dorji Lama, Elisabeth Kerkhoff, Elke Selter, John Shores, Joyce M. Mendez, Krishna Poudel, Lies Kerkhoff, Marianne Heredge, Mohinder Slariya, Pritika Chand, RBS Rawat, Sahana Ghosh, Sumudu Priyantha, Veneeta Singha, Wolfgang Bayer

A discussion on 'Education for Sustainable Development' was held from 22 October 2007 to 19 November 2007, initiated by Dr Rashmi Gangwar from the Centre for Environment Education (CEE), Ahmedabad, India. The thread of the discussion followed a number of themes.

Use of mother tongue in the classroom, when the national language is different was explored. In September 2007, Save the Children Nepal issued a policy statement on 'Use of language in children's education'. Language can present an enormous barrier for children when they start school and they do not speak or understand the language that is being spoken by their teachers. It is argued that this forms a disincentive to enroll, or that many drop out because of difficulties in speaking the official language.

A resource or 'alternative education', a centre teaching children in their mother tongue in Orissa shares the experience that their students have been learning quite fast. Success has been measured by the number of children who have been able to go on and enroll from the education centre to formal schools, and their progress to higher classes tracked. According to the teachers at the government schools where they have registered, they are doing better than the other students in their class.

\* Ms. Heredge is Programme Officer, Information Services at Mountain Forum Secretariat.

+ See also the recent ICIMOD (2006) publication *Community Rights and Livelihoods in the Nanda Devi Biosphere Reserve, India*.

In Lahaul, Himachal Pradesh in India, experience in using the mother tongue, the Miyari dialect, was different. Hindi is used as the majority of the teachers come from other regions of Himachal with different mother tongues. The younger generation is seen increasingly to be more proficient in Hindi than in Miyari and, at times, appearing to be embarrassed by their mother tongue which they see as 'inferior'. A second generation Lahauli expressed that it was a common problem to find youngsters drifting away from their mother tongue. Teachers of Lahauli origin use their local language to facilitate the learning process in the classroom and as a result, classroom teaching and the performance of children have been observed to have improved tremendously. However, the drawback is that homework and examinations need to be written in Hindi or English. Despite their clear understanding, students have problems expressing themselves because of language barrier. So children who go through their whole schooling in Lahaul often have a weak base in Hindi and English that can affect their whole future.

Questions were raised on the practicability of teaching in the mother tongue when there was more than one ethnic group being taught, and how to find teachers who could speak the students' mother tongue.

The problem of educating nomads who perennially shift habitats was

looked at in a number of countries. In Pakistan, an NGO called the Rural Litigation Entitlement Kendra (RLEK), based in Dehradun, worked with the Van Gujjars, a pastoral group which practiced transhumance, to develop an innovative adult literacy programme not restricted to children but including 15 to 35 year-olds. Volunteers were found to go to work with these communities. At first, the volunteers faced resistance from the communities who viewed them as 'outsiders' trying to impose development to the community. In time rapport was developed, but it was difficult to find volunteers willing to spend long periods in these remote areas. Primers were prepared in the local language and transliterated into Devanagiri using material and examples related to the lives of these nomads, to make the education programme more relevant. The programme also helped people become aware of their rights and entitlements and also to keep accounts so that they would not be cheated. RLEK's adult education programme helped in a growing recognition that education was all pervasive and had a key role to play, even for people following a traditional pastoral lifestyle.

In Australia, children in remote areas are allowed to stay at home with their families until age ten or twelve. This is allowed if the mother or someone else in the household is literate to an extent and can teach the child; or a radio system is in place and the government can provide long distance support; or

the course material can be received via a reliable postal service. This can fulfill basic educational requirements, but beyond that, boarding schools then become inevitable.

In Ethiopia, a decentralised approach is promoted by the Afar Pastoral Development Association. Students were not integrated into the mainstream educational system, even if some did continue on into that system later, but the focus was to help people develop literacy and numeracy. Members from the pastoral community were trained as teachers and after being trained, move with a pastoral group to provide teaching, normally in the evenings and not only to children but anyone who wants to learn.

The cost of educating these children needs to be considered, however. As soon as attempts are made to extend the same level of coverage to a dispersed or mobile population, the costs rise. The issue then becomes political: how much should the concentrated population subsidise the cost for a small, dispersed section of the population?

There is innovative use of 'open classrooms' by Adventure Foundation Pakistan, supported by the GEF Small Grant Program of UNDP. Ten-day long summer camps in the mountains have been organised for hundreds of children from all over the country during the past few years, teaching them about the environment and conservation.

One member of the on-line discussions called for a review of the curriculum at higher education levels across a range of disciplines to take into account education for development. Another contributor warned of the need for care in trying to impose external and inappropriate education on people in fragile environments, where they already have a tradition of being guardians of that environment. Another suggested reviving Tagore's open classrooms.



International Mountain Day, 11 December 2007, Lakure Bhanjyang, Nepal

APMN



## Book Review

### Reducing Carbon Emissions through Community-managed Forests in the Himalaya

– K. Banskota, B. S. Karky, and M. Skutsch

#### Reducing Carbon Emissions through Community-managed Forests in the Himalaya



Editors  
Kameli Banskota  
Bhaskar Singh Karky  
Margaret Skutsch



The world's average temperature has risen more in the last 100 years than in the last 10,000 years. Of the 10 recorded warmest years in history, nine were recorded during the last decade. Greenhouse gases from human activities are among the major causes for the alarming trends. Two of the most recent policy instruments devised to address these issues are the United Nations Framework on Climate Change and the Kyoto Protocol, which offers creative, market-based measures that allow emission producers to offset their emissions by paying others to carry out emission reducing activities. But the solutions offered under the Protocol fail to consider one important source of emissions in developing countries – deforestation and forest degradation. The Kyoto Protocol commitments will be reviewed in 2012, and possible changes are now being debated. This book provides a timely addition to the discussions, and urges the inclusion of avoided deforestation in carbon

offset measures in the Framework on Climate Change. Field studies in India and Nepal show how communities can carry out the measurements needed to calculate carbon sequestration, the basis for calculating the impact of avoiding deforestation. Including 'avoided deforestation' in climate change policy will not only help the global climate, it will provide a way for millions of poor people in developing countries to benefit directly, and will help stop the destruction of forests and encourage further conservation.

The discussions are already moving forward. World Bank President Robert Zoellick announced at the Conference of Parties (COP) 13 in Bali, Indonesia that the Bank is developing a new funding mechanism that can be a tool to protect forests and support indigenous people. The World Bank will develop two funds, one to reduce deforestation and another to allow nations to sell credits for successful programmes battling carbon dioxide. Developed countries that pollute more than the allowed limits under the existing Kyoto accord would be able to buy the carbon credits to increase their emission levels and help finance projects to protect forests.

The book was published by the International Centre for Integrated Mountain Development (ICIMOD) in 2007, prior to the Conference of Parties 13 in Bali, Indonesia in early December.

On the web: <http://dev.icimod.org/elibrary/index.php/search/publication/500>



## Past Events

### Fourth International Conference on Environmental Education

The 'Fourth International Conference on Environmental Education: Environmental Education towards a Sustainable Future – Partners for the Decade of Education for Sustainable Development' was held in Ahmedabad, India from 23-28 November 2007. The conference focused on the strategic role of education, especially in the light of climate change. It also provided a platform for sharing experiences and best practice and exchanging ideas about ongoing and planned initiatives in the field of environmental education and education for sustainable development. The challenges for environmental education as a champion of ESD were discussed and opportunities explored to establish partnerships to further the cause of sustainability across all sectors of the international community.

The Conference brought together participants from around the world and across sectors that included environment, health, water and sanitation, human rights, gender, peace, citizenship, social justice, civil society/NGOs, corporates, academics, media, government and UN agencies. The themes for the working sessions of the conference were crosscutting and had been developed based from the 'UN Decade of Education for Sustainable Development' perspective.

The participants were educators and innovators, scientists, development practitioners, some policymakers from India, the host country of the conference, and the international development community including high-level participants like the Chairman of the Intergovernmental Panel on Climate Change, Dr. Rajendra Pachauri; the UNESCO Director General, Koichiro Matsuura, the Director General of the South Asia



# Events

Cooperative Environment Programme (SACEP), the UN Special Ambassador to Asia and the Pacific, and many more.

The conference concluded with the 'Ahmedabad Declaration 2007: A Call to Action'. The drafting process involved more than 1,200 participants from 78 countries. The conference was sponsored by UNESCO, UNEP, and the Government of India and was hosted by the Centre for Environmental Education at Ahmedabad, India. Since the first international conference was held in Tbilisi, Georgia in 1977, conferences have been held every ten years, in Moscow in 1987 and in Thessaloniki, Greece in 1997. The declaration was drafted in the context of DESD and is available at <http://www.tbilisiplus30.org/index.htm>.

## International Mountain Day 2007 Celebration in Nepal

The Gorkha Tourism and the Nepal Travel and Media Association (NTMA) jointly organised a one-day hike and interaction programme for and among press and media representatives and representatives from the development and tourism sectors in celebration of 'International Mountain Day 2007' in Nepal. The theme this year is "Facing Change: Climate Change in Mountain Areas". The main objective was to provide local journalists with insights into environmental and developmental concerns and issues that face Nepal, especially in context of global warming and climate change.

Experts from the International Centre for Integrated Mountain Development (ICIMOD), the Nepal Mountaineering Association, the Himalayan Expeditions, GT and NTMA shared their views on this year's theme.

The event was supported by ICIMOD, WWF Nepal, NTMA, and the Himalayan Expeditions and the Trekking Agents Association of Nepal (TAAN).



## Upcoming Events

### 7-9 January 2008

International Workshop on Snow, Ice, Glacier, and Avalanches  
Mumbai, India  
Email: [workshop@csre.iitb.ac.in](mailto:workshop@csre.iitb.ac.in)  
Web: <http://www.csre.iitb.ac.in/csreworkshop/index.html>

### 31 March–22 April 2008

ICIMOD's Second International Training Course on Low Cost Soil and Water Conservation Techniques and Watershed Management Activities  
Kathmandu, Nepal.  
Deadline for registration: 7 March 2008  
Contact: Keshar Sthapit  
[ksthapit@icimod.org](mailto:ksthapit@icimod.org)  
Web: [http://www.icimod.org/webcalendar/view\\_entry.php?id=560&date=20080331](http://www.icimod.org/webcalendar/view_entry.php?id=560&date=20080331)

### 14–16 May 2008

International conference on school safety  
Islamabad, Pakistan  
Contact: [akpbsp.k@akpbsp.org](mailto:akpbsp.k@akpbsp.org)  
Web: [www.akpbsp.org](http://www.akpbsp.org)

### 25-29 August 2008

International Symposium: the role of geomorphology in environment management  
Yogyakarta, Indonesia  
<http://www.geomorph.org/sp/arch/IntSymIND2008-1.pdf>

### 8-11 September 2008

Tenth international symposium on high mountain remote sensing cartography  
Kathmandu, Nepal  
Contact: [pmool@icimod.org](mailto:pmool@icimod.org)  
Web: <http://menris.icimod.net/news/showdetail.php?id=193>

### 11-15 November 2008

Management of Landslide Hazards in the Asia-Pacific Region  
Sendai, Japan.  
Contact: [landslide\\_conf08@izcc.tohoku-gakuin.ac.jp](mailto:landslide_conf08@izcc.tohoku-gakuin.ac.jp)  
Web: <http://japan.landslide-soc.org/index-e.html>

Browse the calendar of events at [www.mountainpartnerships.org/events](http://www.mountainpartnerships.org/events)

*If you have any information on sustainable mountain development initiatives in Asia and the Pacific that you would like to share with other mountain communities, please send it to:*

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