

## Contents

### FEATURES

- ▲ **Glaciers of the Karakoram Himalaya, climate change and water supply concerns**  
– Kenneth Hewitt
- ▲ **Interview**
- ▲ **Coordinator's Notes**

### MOUNTAIN HIGHLIGHTS

- ▲ **Artificial glacier grafting: Indigenous knowledge of the mountain people of Chitral**  
– Dr. Inayatullah Faizi

### APMN NEWS

- ▲ Mountain Forum Open House programme
- ▲ Other activities

### FROM OUR MEMBERS

- ▲ **Shifting Cultivation: a waste of forests or an integrated farming system?**  
– Elisabeth Kerkhoff
- ▲ **Towards building peace in the greater Himalayas – Northern Areas of Pakistan**  
– Ismail Khan

### BOOK REVIEWS

- ▲ **Impact of Climate Change on Himalayan Glaciers and Glacial Lakes**
- ▲ **The Little Green Book: An interview with Cordilleras Environment**

### EVENTS

- ▲ Past events
- ▲ Upcoming events

## Glaciers of the Karakoram Himalaya, climate change and water supply concerns

– Kenneth Hewitt<sup>1</sup>

A rapidly diminishing ice cover is reported from much of High Asia. Some predict the disappearance of many glaciers over the next 50 years. This is not the picture in the Karakoram Himalaya, at least for the moment. Some of the largest glaciers have undergone rapid thickening since the mid-1990s; twelve intermediate glaciers and fifteen high altitude tributaries were observed advancing. There has been an exceptional number of catastrophic advances, or surges; sudden, short-lived advances of some kilometres in a few weeks.

The Karakoram and adjacent ranges have the largest concentration of perennial snow and glaciers in High Asia, indeed, on mainland Eurasia. The Upper Indus Basin contains the larger fraction, or about 22,000



Kenneth Hewitt (right) with Dr. Claudio Smiraglia, glaciologist in Milan who has worked on the Blatoro Glacier in the Karakoram.

sq.km, including most of the largest valley glaciers outside the polar regions. Twelve of them comprise almost half the Karakoram ice cover.

To put this in context; from the 1920s to the 1990s Karakoram glaciers underwent a steady but, ultimately, enormous reduction. Perhaps one third of the ice mass was lost, compared to the Little Ice Age (LIA) – an episode of global ice increase from the 16th to the late 19th centuries. The recent expansions were only observed in the highest, central parts of the Karakoram (Hewitt 2005; Ding et al. 2006). In surrounding areas and smaller glaciers recession has continued, but not the catastrophic rates of loss described elsewhere.

How this relates to climate change is uncertain, or whether it will continue, but a region-specific response is involved. It is essential to identify what distinguishes the region within High Asia. Two related but distinct sets of factors stand out: a unique climatic regime, and the exceptional elevation and elevation ranges of the ice masses.

Karakoram glaciers come under the influence of three seasonal weather systems. A westerly or 'sub-Mediterranean' circulation dominates the winter half of the year, and accounts for about two-thirds of the snow nourishing the glaciers. In summer, Indian Ocean air can enter the region at high altitude, and accounts for about one-third of glacier nourishment. The summer monsoon is probably the main factor. As a result, glacier mass balance is intermediate between the summer

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## Coordinator's Notes

The Asia Pacific Mountain Network (APMN) is pleased to bring you the second issue of bulletin in 2007. The Bulletin informs our network activities; is a platform for taking stock of discussions on critical and emerging themes; and highlights membership initiatives, thereby creating a sense of the regional mountain community that we are.

APMN is in a period of change and review. At the recent Mountain Forum Board and Node Managers Meetings, there were many discussions on the changing functions of the network against a backdrop of improved ICT connectivity and vastly increased opportunities for information sharing and access. The relationship with the Mountain Partnership is also developing, and there are exciting prospects for future synergy in the activities of Mountain Forum, the individual nodes, the Mountain Partnership, and others concerned with the Mountain Agenda. The present agreement for APMN finishes at the end of June, and the node will be maintained under an interim arrangement while the plans for the next phase are finalised. We see many exciting opportunities, and hope that the next phase will see a marked increase in activities, and involvement and interaction with members. The outlook is good: APMN has continued to increase its membership base and can now (June 2007) count 1014 individual members and 152 organisational members – an increase of 20% individual and 15% organisational members in only five months. We ask you to encourage all those interested in mountain issues to join the list, contribute to discussions, and exchange information so that our community becomes a vibrant interaction forum.

Our activities continue, read more in the sections on Features, Discussion, and APMN News much of which was contributed by members. We welcome input and comments, and suggestions as to how to serve you better. Make use of your Forum for passing on news and information, and starting discussions. We look forward to hearing from you.

A. Beatrice Murray

accumulation types of the Greater Himalaya, and the winter accumulation of the Caucasus and European Alps to the west. Inner Asian anticyclones affect the behaviour of the other two systems, including storm paths and the incidence of clear weather; critical since direct solar radiation is responsible for 80-85% of ice melt.

What complicates the problem of assessing and predicting glacier changes is that global climate change has and will alter the absolute and relative roles of these three air masses. The most likely explanation of recent expansions is increased summer storms and cloudiness reducing ice melt – even though high altitude temperatures may be increasing.

Meanwhile, the problem of climate change is not just about average shifts in, say, regional temperatures or precipitation. Equally critical is how these play out vertically between glacier termini as low as 2,400m above sea level (masl), and source or accumulation zones above 5,000m. There is a five to ten-fold increase in precipitation over this elevation range, and a large drop in temperatures.

The zone of maximum precipitation lies between 5,000 and 6,000 masl – much higher than is reported in the tropics generally, or the central and eastern Himalaya, in particular. Some

90% of the glacier accumulation zones lie at this height. Furthermore, most high altitude snowfall is avalanched down rock walls before incorporation into a glacier. All but a few Karakoram glaciers are mainly or wholly avalanche-fed. Changes in snowfall and temperature patterns alter the timing, character and extent of avalanching, which should affect glacier behaviour. There is no research to tell us just how – another problem in predicting climate change impacts.

Below about 5,000 masl are the glacier ablation zones where melting for some part of the year causes a net loss of ice and production of melt water. The decisive conditions for glacier contributions to water supply occur between 3,800 and 4,800 masl, where more than 80% of the ice surfaces that actually melt in summer lie.

Another factor is the role of dust and debris in ice melting. Dirt layers a few millimetres thick can increase melting by 40% or more (Hewitt 2005). Debris thicker than 4-5 cm reduces melting, which can be minimal under more than 30-50 cm of debris. The lower ablation zones of most Karakoram glaciers have heavy debris covers, mainly reflecting the extent of avalanche nourishment. However, the role of debris in these areas has been exaggerated. More extensive, and more sensitive to secular climate change, is the dusty and dirty ice in the mid to upper ablation zones. Moreover, the response of heavy versus light debris is opposite in sign and significance.

Continuous heavy, ablation-suppressing debris is a passive and relatively conservative factor. In contrast, dust and thin debris are highly sensitive to weather



The accumulation zone of the Biafo Glacier, Central Karakoram between 5,000 and 7,000m

conditions. In clear summer weather seemingly bare or 'clean' ice soon becomes covered in wind blown dust, melted out sediment particles, and films of algae. In cloudy weather, however, dust and dirt wash away. Down to 4,000 masl or so, summer precipitation is generally snowfall which reflects sunshine and shuts down melting. The shortness of the main ablation season means small changes here can have large effects.

In terms of water supplies, it is not enough to focus on general or total yields. Equally critical is the incidence of more extreme events, glacier floods or droughts and, especially, so-called shoulder seasons. The latter involve the timing and rate of river rise in spring, when farmers and municipalities can be desperate for water. In the autumn, tough decisions must be made to balance water storage in reservoirs against flood capacity. Meanwhile, on the southern flank of the Himalayas, during the period of high river flows from the glaciers, the greatest problem is not water supply but coincidence with monsoon-generated floods – too much, not too little water, and limited capacity to control it.

Much has been said about the prospect of more severe floods or of 'river drought', as glaciers melt very fast or disappear, respectively. Noone seems to have a clear picture of how this may affect shoulder season flows, or the balance of rainfall over snow melt.

The risk of glacier lake outburst floods (GLOFS) has received particular attention, but they involve very different conditions in the Karakoram compared, say, to the eastern Himalayas. In the latter, retreating glaciers are the most threatening. In the Karakoram, the most destructive GLOFS have occurred during glacier advances, mainly due to tributary glaciers damming main rivers.

Another hazard, glacier surges, is virtually unknown in the Greater Himalaya but concentrated in the Karakoram. In the past two decades at least 14 glaciers have surged; more than in any comparable period since records were kept (Hewitt 2007). Climate change is involved, but no one knows exactly how.

A major problem is the lack of the good, consistent and long term information needed to understand what is happening. Some Karakoram glaciers have been studied in dozens of expeditions since the 1850s but, as a whole, the region's snow and ice remains poorly known. Weather and gauging stations are at elevations well below the glacier basins, or well away from them and in valley floor locations strongly modified by surrounding mountains and valley wind systems. There is no on-going monitoring of the glaciers themselves or of glacier climate.

Equally, the implications of glacier change for the region's societies are not as obvious as media reports suggest. First, the implications for whole countries or large drainage basins like the Indus are not the same as for the thousands of local communities in the mountains themselves. National and international interest has been almost wholly focused on the big rivers, flow and flood forecasting for them; on down country populations and major engineering works. It is not surprising, since snow and ice melt from the Karakoram and surrounding ranges dominates the flow of the main Indus and the Yarkand Rivers. However, mountain communities depend largely on small-scale surface water resources from small ice masses, snow fed streams, and springs. They cannot control waters



**Debris-covered terminus (large arrow) of the Biafo Glacier at 3,000m. Small arrow shows the position of the terminal moraine in the 1890s; there has been a retreat of 2.5 km**

Kenneth Hewitt

from the larger glaciers and rivers, although these are important for communications, or attracting tourists.

There are also big differences within as well as between these two constituencies. For the main national populations the demands of cities, or of power generation, may conflict with the agricultural sector; public versus privatised water systems; or increasingly adverse impacts of water use on riverine ecosystems. In the mountains, the scale and even the balance of benefit and loss are not the same for pastoralism as for irrigation or tourism; modernising versus traditional activities; which will suffer more from drought or flood, and how.

Mountain peoples' adaptations to the presence of glaciers vary in every valley of High Asia. As in so much else, diversity is central here too. Unfortunately, investigations of the range of benefits and risks involved, and most published assessments, impose concerns, scenarios, and hazards that outsiders are preoccupied with. They are dominated by downstream and national or international interests.

The fact that Karakoram ice is not collapsing does not mean that climate change is absent, or that warming is not occurring. If you talk to farmers throughout the region they will tell you winters have grown



# Interview

shorter in recent decades, there is less snow and more rain. Crops are in greater danger from wind storms and rain during summer and at harvest time. To date, these are more significant hazards than anything happening to the glaciers.

To conclude: the good news is that the Upper Indus Basin glaciers are not 'disappearing', or not yet. The bad news is that the climate and glaciers are indeed changing, and in ways that have serious implications for water management and natural hazards. Yet, knowledge and monitoring systems to assess and plan against these problems are quite inadequate.

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The Panmah Glacier, Central Karakoram, showing the surging tributary Maedan Glacier in the middle background 4,000 – 7,000 masl



## Interview with Dr. Dinesh Bhujju, Research Associate at Resources Himalaya Foundation in Kathmandu, Nepal



**Dr Dinesh Bhujju** is a research scientist, with a PhD from Chiba, Japan and plant conservation training from Reading, UK. He

works on forest ecology and science popularisation. Dr Bhujju is a research associate at Resources Himalaya Foundation (RHF) in Kathmandu, and currently its chief executive. RHF is an independent regional think-tank with a mission to secure nature through good science and politically correct decisions. Owing to its conservation efforts, RHF has recently been awarded the 2007 MacArthur Award for Creative and Effective Institutions. Ms Sapana Lohani, from APMN, discussed with Dr Bhujju on biodiversity conservation in the Himalayas and his research interests.

**Q. What are the major threats to Himalayan biodiversity, and how can their effects be reduced?**

**A.** In generic terms, the major threat to Himalayan biodiversity is habitat loss due to massive changes in landscape use. The conversion is not only from natural forests to croplands, but also from farms to settlements; this is eroding genetic resources and agricultural biodiversity at an alarming rate. At ecosystem level, the threats may vary and be more specific. In protected areas, the threats are poaching for high value products, illegal timber harvesting, and tourism pressure, while in wetlands the threats stem from industrial pollution, invasive species, and encroachment. In the mountains and rangelands, the biodiversity is exposed to heavy grazing and over use of natural

resources. Beside these, the Himalayas are threatened by natural disturbances resulting from climate change, landslides, and soil erosion. For the inherent problems, we have no solution. However, for human generated problems there are mitigation measures.

**Q. Are there any successful conservation initiatives in the Himalayas? What was special about them?**

**A.** As the Himalayas have evoked wonder, praise, and veneration through the known ages of man, there have been continued efforts to conserve their nature and biodiversity for a long time. The specialty of past initiatives is found in the indigenous knowledge system that we still practise, while in recent events we find them in increased community participation and stakeholders. However, achievement is also a relative term, depending on how you see the glass – half-full or half-empty of water.

**Q. The Himalayas are a biodiversity hotspot, but people here are among the poorest in the world. How do you see this?**

**A.** Yes, the Himalayan region is rich but its people are economically poor. This is because these are two different entities. The first is the natural set-up, and the second is the creation of a class-society. Not only the Himalayan people, the inhabitants of rain forests near the tropics are also very poor. Poverty is the product of bad governance and exploitation, that is, there are sociopolitical factors. The richness of nature, on the other hand, is not governed by any social or political factors, but by its own dynamism.

**Q. In the HKH region, Bhutan has achieved much in the field of conserving natural resources. How can Bhutan set a global example in sustainable conservation?**

**A.** Not only Bhutan, others have also achieved much in conservation. In many cases, the success stories are overshadowed by other issues that give a negative impression, and remain unnoticed. For instance, community forestry as practised in Nepal, China, and India has emerged as a global model to address poverty associated with rural livelihoods and biodiversity conservation. There are more such examples; the important thing is that we learn not only from success but also from failure.

**Q. Can you comment on the viability of the transboundary conservation approach in the Himalayan region?**

**A.** The transboundary approach has created opportunities in linking protected area systems, learning from experience in landscape level planning, forging wider partnerships among national and international organisations, and converting vulnerability of mountain communities into security. Much of the transboundary landscape falls on national borders in remote areas that are left out of development initiatives. Therefore, the success of such initiatives depends on how the local communities are made capable to undertake the stewardship of conservation and management.

**Q. What are the possibilities for securing financial sustainability for the protected areas in Asia?**

**A.** It is true that protected areas are facing serious challenges and many are in dire need of financial support to achieve their conservation and sustainable development objective. Three major sources have long provided the bulk of protected area funding: a) government budget

allocations; b) multilateral, bilateral, and NGO grants and loans; and c) borrowing from banks and other commercial lending institutions. In the region, Bhutan has created a trust fund, while Nepal and Pakistan have involved local communities to sustain the management of conservation areas. The protected areas cannot be sustained for long on external grants; and privatisation will broaden the gap between poor and rich. Therefore, protected areas should diversify their services and bring benefits to the local communities for sustainability.

**Q. A few years ago, you initiated the preparation of a nationwide ecological database on the Churiya hills of Nepal. Would you explain its importance for conservation?**

**A.** In the past, the Churiya hills in Nepal were neglected because of the low water table, high erodibility, sparse wildlife and absence of charismatic species, and low productivity. Now, there is a growing concern about the Churiya, whose sphere of influence has been realised for three important reasons: 1) once contiguous Terai forests have fragmented beyond restoration; 2) protected areas and their buffer zones are inadequate in large-scale conservation; and 3) rapid deterioration of the Churiyas needs to be addressed properly as they provide the only land bridge for biodiversity conservation at the landscape level.

**Q. You are also involved in teaching. What do you think is the major weakness that academia has in the field of biodiversity conservation?**

**A.** Academia in our region is too theoretical in its course contents and groomed with an inward looking attitude. This is partly because of the fact that the research labs were developed separately from the academic institutions. A kind of taboo

thus flourished that academic institutions are only there to teach and distribute diplomas. For years, we kept on producing amputated knowledge carriers who severely lacked field experience and research skills. The inward looking attitude of academia excluded them from contemporary knowledge floating elsewhere. It still needs radical transformation in order to catch up with the world.

**Q. Recently, you led a research team involving European scientists in establishing permanent plots in the Sagarmatha (Everest) region. What was the purpose of the plots?**

**A.** We set up two permanent plots of one hectare each at the timberline in the Sagarmatha region: one at Pangboche (4050 masl) and the other in Debucho (3850 masl). We logged the ecological data of all the tree species in the plots, over 1,500 individual trees, and also collected some 200 tree cores. The permanent plots will provide reference sites for the future to assess the impact of climate change on the vegetation, while we hope to re-construct the environmental history of the site by analysing the tree rings in the collected cores.

**Q. Lastly, we would like to congratulate your organisation for receiving the MacArthur Award 2007. How has the success influenced your activities?**

**A.** Thank you for your compliments. The Award has made us more responsible for the cause of conserving nature in the Himalayas through good science and politically correct decisions.



[www.resourceshimalaya.org](http://www.resourceshimalaya.org)



# Highlights

## Mountain Highlights

### Artificial glacier grafting: Indigenous knowledge of the mountain people of Chitral

– Dr. Inayatullah Faizi<sup>2</sup>

Among the mountain communities of the Hindu Kush range, political division of borders did not matter at all during the pre-colonial era. People had easy access to both sides of the watershed until the late 19th century AD. The eastern Hindu Kush range separating the eastern Oxus basin from the northern Indus basin had a number of passes which enabled frequent interaction between the people on the two sides of the mountain. Places such as Farghana, Andijan, Sheghnan, Khorog, and Sariqu were connected with Gilgit, Baltistan, and Chitral through a number of passes traversing the mountain belt at heights ranging from 4000m to 6000m.

Folk stories from the 12th and 13th centuries reveal that mountain farmers had two pieces of property each, one on the southern side and one on the northern side of the Hindu Kush. Cooked meals would be carried from one side of the watershed to the

other before getting cold. Lovers would meet and exchange gifts from across the border. In the 12th century, however, the military campaigns and adventures of Genghis Khan sent a wave of threat across the southern valleys of the Hindu Kush, and people resorted to blocking the mountain passes by grafting artificial glaciers. The strategic move was similar to the erection of the Great Wall of China during the first millennium.

The Hindu Kush range is young, and the rocks and glaciers still at the formation stage. Had there been no threat of climate change, the glaciers of the Hindu Kush would still be in the formation stage instead of facing the dangers of cracks, crevices, and recession. As it is, the glaciers are receding. But the mountain communities in the Chitral district of NWFP still have the know-how and skills to carry out artificial glacier grafting, and are using it to develop artificial glaciers.

The procedure is tedious and prolonged. It is carried out in three stages. The first is identification of

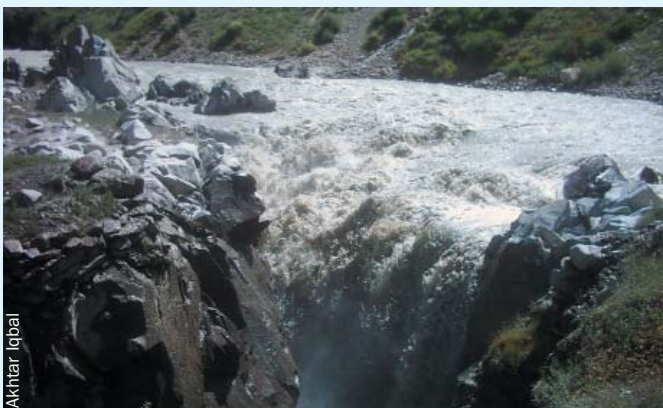
the site based on the following criteria:

- must be beyond the range of vegetation,
- must not face the sunny side, and
- must not have loose sediments, shale, or soft soil.

After selecting the site, the community collects necessary material:

- pieces of masculine glacier,
- pieces of feminine glacier,
- dried hay,
- dried pine needles,
- saltish soil called ‘rezg’, and
- large quantities of compressed snow.

According to legend, blackish pieces of glacial deposit are considered to be feminine, or the ‘mother’ of glaciers, whereas white pieces of glacial deposit are considered to be masculine. This is why the common name for glacier in Khowar, the local language, is ‘shah yoz’ which means ‘black ice’. Experts in glacier grafting consider that a combination of masculine and feminine characteristics is a must for success.



View of the lower portion of Chiyar Tar Glacier, the source of River Kabul in Baroghil Chitral, Pakistan



Himalayan Yak in Baroghil, Chitral Pakistan

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The materials are crushed and mixed together and the mixture placed in layers with the compressed snow. Fresh snow is added to the stock at the time of each snow fall. The glacier starts to grow within a year, and the experts look after the process for three to four consecutive years. After this, the glacial activity starts in full swing and the glacier accumulates more and more ice every year after each snow fall.

Artificially grafted glaciers have been recorded in Udren, Roshgol, Ziwar, Ujnugol, and Shagol along the crest of the Hindu Kush dividing the Districts of Chitral in Pakistan and the Uluswali of Wakhan in Afghanistan. This practice was a normal routine until 1895 when the British forces were stationed in Chitral and Gilgit and the people no longer needed indigenous ways to defend their territory. However, the people still used this technology to graft artificial glaciers for the purpose of producing irrigation water. One such example is the glacier of Oweer, artificially grafted by Muhammad Siyar of Shogram in 1812 AD.

Started in the 12th Century as a defence mechanism, the practice of artificial glacier grafting was replicated in 1990 by local communities in Shigar, Khaplu, and Ganche in Baltistan, through the financial support of the Aga Khan Rural Support Programme (AKRSP).

Experts in traditional knowledge believe that indigenous people have similar answers to many of the ecological problems emanating from the trend of global warming and climate change.



**DO YOU HAVE A FAVOURITE MOUNTAIN AREA OR TOPIC? SEND US YOUR ARTICLE TO SHARE WITH MEMBERS OF THE NETWORK.**

## APMN News

### Mountain Forum Open House programme

The Mountain Forum Secretariat (MFS) and Asia Pacific Mountain Network (APMN) co-organised an Open House for Mountain Forum members on 18 January 2007. The program was an offline interaction on topical mountain-related themes. More than 50 people participated in the half day event: Mountain Forum members, delegates from different organisations, ICIMOD/MFS staff, and other individuals interested in learning about and joining the network.

The programme was opened by Dr. Ana Maria Ponce, Executive Secretary, MFS, followed by welcome remarks from Dr. Madhav Karki, Deputy Director General- Programmes, ICIMOD, and Dr. A. Beatrice Murray, Acting APMN Coordinator. Dr. Nakul Chettri, Community Biodiversity Specialist, ICIMOD, gave the first presentation on 'Biodiversity conservation beyond boundaries: A landscape approach through partnership', a paper co-authored by Ms. Bandana Shakya, Research Associate, Transboundary Biodiversity Management, ICIMOD, which highlighted the role of transboundary cooperation through partnership to help countries meet their conservation goals. Dr. Eklabya Sharma, Programme Manager, Natural Resource Management, ICIMOD, provided a commentary and Dr. Ana Maria Ponce moderated the plenary discussion. Dr. Siddhartha Bajracharya, Member Secretary, National Trust for Nature Conservation (NTNC) gave the second presentation on the topic 'Community-based biodiversity conservation in the Annapurna Conservation Area', focusing on the importance of community-based approaches in biodiversity conservation. Dr. Eklabya Sharma gave the commentary and the plenary

discussion was moderated by Dr. Madhav Karki. The participants were also introduced to various Mountain Forum services including publications, online library, website, and e-conferences; and Certificates of Membership were distributed to the Mountain Forum members at the programme.

The programme was successful in organising an interaction among experts, delegates, and interested members on some mountain-related topics of growing concern. The programme was facilitated by Mr. Udayan Mishra, Acting Node Manager, APMN, along with other staff from APMN and MFS.

Abstracts of both papers can be accessed at:

<http://www.mtnforum.org/apmn/mfoh2007/1-AbstractPaper-session1.pdf>

<http://www.mtnforum.org/apmn/mfoh2007/2-AbstractPaper-Session2.pdf>

### Other activities

Various activities have been carried out since the last issue of the Bulletin was published in January.

A survey on broadband connectivity in mountain areas of Nepal was carried out in May/June under an agreement between MFS and the Mountain Partnership as a contribution to a wider comparative study including a similar survey in mountain areas in Romania. The Nepal survey was carried out by the Forum for Information Technology (FIT Nepal) on behalf of APMN. The results will be presented in the next issue of the Bulletin.

A study is being carried out for the Mountain Partnership to assess the communication needs in Central Asia, especially as these relate to Mountain Forum and the Mountain Partnership, and focused on Kyrgyzstan and/or Tajikistan. The results and recommendations will be published in September.



# From our members

## From our members

### Shifting Cultivation: a waste of forests or an integrated farming system?

– Elisabeth Kerkhoff<sup>3</sup>

Branded 'slash-and-burn' by the general public, the practice of shifting cultivation or swidden farming has had a bad reputation for decades. What people see is that patches of forest are cleared and burned, cultivated for a few years and abandoned, after which farmers open up a new patch. This is considered wasteful of forest, a danger to wildlife, and, since the farmers are often very poor, unproductive. Fuelled by this widespread public opinion, governments across the eastern Himalayas have made considerable efforts to control this practice, forcing farmers to adopt alternative means of livelihood. But is this the true picture?

Why is shifting cultivation still a prominent farming system in this region, providing a major source of livelihood for numerous ethnic minorities and other poor and marginalised communities? Why do its practitioners insist on keeping this way of life? It is thought that the majority of the estimated 400 million indigenous people in Asia who depend on tropical forests practise shifting cultivation; some 10 million hectares of land in South Asia alone. So why do these farmers maintain their practice across such vast areas, despite so many incentives to stop?

There must be something to shifting cultivation that makes sense, at least in the opinion of a growing number of researchers and other professionals in India, Bangladesh, Bhutan, Nepal, China, Thailand, Laos and other

countries in the eastern Himalayas. If it was really unproductive, why would farmers not adopt the many alternatives they are offered? And why would they keep making the effort to clear land on very steep slopes? Answers to these questions are possible if shifting cultivation is studied as an integrated farming system that makes sense to its practitioners – the term 'rotational agroforestry' has been suggested as a good description. Farmers use their agricultural plots in a rotational cycle, growing crops for two years, and leaving the plots 'fallow' to grow productive and other trees for around ten years. Recently research was undertaken from this point of view in the form of case studies on farmers' good practices and innovations, and it has led to useful new insights.

From this perspective, it becomes clear that the practice of shifting cultivation has important benefits, both for its farmers and for society at large. Compared to permanent agriculture, shifting cultivation maintains higher levels of agrobiodiversity, retains forest cover on agricultural land, and is more compatible with wildlife conservation. It includes a number of technologies for soil and water conservation. Furthermore, farming produces a number of (potential) commercial niche products. Production is generally organic because chemical fertilisers and pesticides are less applicable. And lastly, it is mostly practised by indigenous farmers, and for them the practice plays an important role in their cultural integrity and social security.

If shifting cultivation is analysed more closely, it becomes clear that



Rai woman sowing maize on a recently burned field (Taplejung, Nepal)

land is far from abandoned when farmers shift to a new plot. Forest fallows are the main source of soil fertility, and regenerating and managing these forests are important activities during both the cropping and the fallow phase. Shifting cultivators are often made out to be encroachers in government forests, but in fact they grow fallow forests on what they consider to be their agricultural land. They have occupied this land for shifting cultivation for generations, usually managed under customary common property regimes.

Controlled burning is the most condemned part of the shifting cultivation cycle, and yet it is essential. If the farmers could not get rid of the forests when they are no longer needed, they would not allow them to grow on their land in the first place. But the trees are essential to protect the sloping land from the impacts of heavy rain and to restore soil structure and fertility. This is shown only too clearly in areas where farmers have been encouraged to clear land and establish permanent agriculture. Burning is not only an effective way of releasing the nutrients stored in the slashed vegetation, it is also essential for weed and pest management and enables farming to remain organic. Controlled burns are not comparable to wild forest fires; entire

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communities organise themselves to make a successful burn that is limited to the area required. In fact, if the forest department burns selective areas to clear them of weeds, it is considered a silvicultural measure.

The farming practice of shifting cultivation is managed at the landscape level, which requires an in-depth knowledge of local natural resources and conditions, as well as strong community organisation. Therefore, local customary institutions play an important role. They include extensive indigenous knowledge, cultural beliefs, and customs; the way farmers organise themselves in labour groups; and customary local-level rules and regulations. Land is often managed as common property, with plots being allocated every year to the village households according to certain locally accepted rules. This ensures universal access to land resources for all community members, and prevents social marginalisation.

The studies found that the problems shifting cultivators are currently facing are mostly the result of counterproductive policies, rather than inappropriate land management by the farmers. Forced conversion to permanent agriculture or forestry has alienated the poorest farmers from their land and forests, thereby causing degradation and increasing poverty.

Agricultural research and extension services show a lack of interest in this indigenous farming system and are unable to address farmers' problems. Most government research and extension services are bent on controlling, rather than improving shifting cultivation, as they do with other forms of agriculture. Furthermore, many of the technological innovations that have been developed for permanent agriculture in the plains are not appropriate for these conditions. As a

result, farmers are left with the challenge to adjust their farming practice to meet with the requirements of contemporary society.

A more appreciative and understanding attitude towards shifting cultivation is essential for creating a policy environment that can build on the existing strengths and potential for development of the system. Shifting cultivation was one of the very first forms of agriculture practised by humans, and its survival to this day suggests that it is a flexible and highly adaptive means of production. It may not be the most productive farming system, especially compared to plains agriculture, but on steep slopes it can be the best available agricultural option, and has many other benefits to offer.



**A typical patchy shifting cultivation landscape including crop fields and fallows** (Taplejung, Nepal)



## **Towards building peace in the greater Himalayas – the Northern Areas of Pakistan**

– *Mr. Ismail Khan, Board Member*

*Mr. Ismail Khan is the elected representative of the Asia Pacific Mountain Network (APMN) to the Mountain Forum Board of Directors for 2005-2007. Below, he shares with us his experiences and some of the activities that he has been engaged in while representing the region and the Asia-Pacific node of Mountain Forum.*

Never in my wildest dreams had I thought that my election to the Board of Directors of Mountain Forum would lead to opportunities for representing poor and conflict ridden mountain communities at important policy tables and discussing peace building processes in South Asia.

Interestingly, my e-election victory as the representative for the Asia Pacific Mountain Network received quite a lot of media attention, thanks to my earlier work in the field of media and development (see [www.dawn.com/2005/06/03/nat11.htm](http://www.dawn.com/2005/06/03/nat11.htm)) and also because I come from a disadvantaged mountain community, as well as the high reputation of Mountain Forum and coverage in the APMN Bulletin.

Peace and security are two major binding constraints for development in the world, and more so for the mountain people who in many places are mere victims, or as people say these days 'collateral damage', in conflicts and wars.

My home region of Gilgit/Baltistan (also known as the Northern Areas of Pakistan) has a unique geographic, political, and constitutional status. Bordering China, Afghanistan, India, and Pakistan, the Northern Areas is the home of K2, the world's second highest mountain, and the world's largest glaciers outside the poles. Here four great mountain ranges – the Himalayas, Karakoram, Hindu Kush, and Pamir – converge to form an amazing mass of towering natural splendours. The region is also home to a medley of indigenous mountain communities (approximately 1.5 million people spread over an area of 72,400 square kilometres). At present, the region is administered directly from Islamabad, it does not

have proper governance, judicial, or democratic institutions, nor does it have any representation in the parliaments of Pakistan, or Azad Jammu and Kashmir. In whose name the region's legal status lies has remained in limbo for the last 60 years. The Northern Areas is where India and Pakistan went to war over the Kargil Hills in 1999, and where the two countries have been locked in a no win war on the Siachan glaciers for the last 20 years or so.

My election provided me with an opportunity to contribute towards building peace in a region where over 16 million mountain dwellers are directly affected by the long drawn-out conflict and where the lives of over a billion people are at the risk of inhalation if (God forbid) a nuclear war were to break out between the two neighbours. I thought I must do whatever I can to foster peace, and amplify the voices of the almost voiceless mountain communities.

It was not an easy decision though. Not only did I have to educate myself on the political sensitivities attached to the complex issues, but I had to do it in a way which allowed the real voices of the people to be heard in the corridors of power in Delhi, Islamabad, and elsewhere. It was a particularly difficult balancing act as Pakistan has never really encouraged people from the area to take part in the dialogue process.



Yak riding in the Pasture of Wakhan, the North Eastern Corridor of Afghanistan

Some of the key points that I advocated are summarised here:

- People to people contact between various parts of the former state of Jammu & Kashmir including Ladakh and Gilgit/Baltistan, eventually making borders irrelevant
- Improvement of human rights conditions in the different regions.
- Establishment of a Peace Park in the Siachan glacier area, with demilitarisation, disengagement from the glacier, and conversion of the glacier into a cross-boundary protected area
- Opening of links between Gilgit-Baltistan and Ladakh – this can unlock massive potential for sustainable mountain tourism in the whole of the trans-Himalaya mountain complex
- Self governance and more autonomy for all mountain regions

I participated and spoke in favour of peace and sustainable mountain development in some of the major dialogues and conferences like the Intra-Kashmir dialogue, Intra-Kashmir 'heart to heart talks', TV talk shows, Dialogue on the Peace Process, Colombo Peace Dialogue, Law & Politics Society of the LUMS, Islamabad Peace Conference, and a Meeting with the European Union Parliament Foreign Relations

Committee, and was also a member of the first ever political delegation from Gilgit/Baltistan to visit the Ladakh region.

### Outcomes

Here are a few of my contributions which I would

like to share.

- Wrote a number of articles/op-eds in The News International on the peace process, and exploring means and ways to further the peace agenda  
(www.thenews.com.pk, in which I write an op-ed each Tuesday)
- A motion for the European Union Parliament on Kashmir raised in the EU Parliament on 24 May which addressed most of the points we had raised over the year
- Crises Group brought out a report on the status and state of affairs of the Northern Areas

The impact of this work, by myself and others, can be seen in many ways:

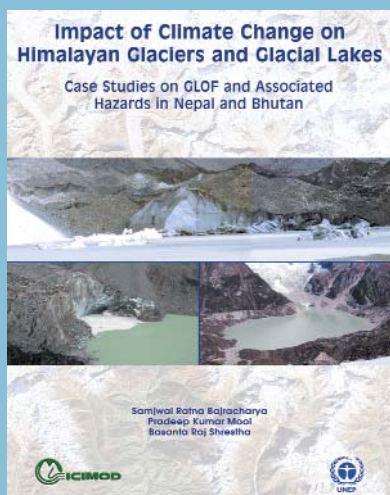
- There is much more awareness at local and national level about the peace process and its possible outcomes. People in the Northern Areas have finally learned to speak out, only last month a resolution was passed in the local council seeking more autonomy and self government
- Overall the constituency for peace stands expanded and strengthened, lessening the miseries of the mountain inhabitants stranded over years of zero sum conflict.

My participation in the peace process was made possible by my election to the Board of Directors of the Mountain Forum as the representative of APMN. It shows yet another way that a network of mountain people and supporters can contribute to improving the lives of its constituents.



## Book Reviews

### Impact of Climate Change on Himalayan Glaciers and Glacial Lakes – Samjwal Ratna Bajracharya, Pradeep Kumar Mool and Basanta Raj Shrestha



This study, prepared by ICIMOD in close cooperation with and supported by the United Nations Environment Programme Regional Office for Asia and the Pacific, investigates the impact of climate change on glaciers and glacial lakes in two major glacial hotspots in the Himalayas: the Dudh Koshi sub-basin in the Khumbu-Everest region in Nepal, and the Pho Chu sub-basin in Bhutan. The focus was on changes in the number and size of glacial lakes forming behind exposed end moraines as glaciers retreat, and the resulting potential threat of glacial lake outburst floods (GLOFs).

The report aims to demonstrate methodological aspects of monitoring and potential GLOF hazard assessment using a case study approach. A hydrological model was used to calculate discharge and flood arrival times in downstream areas, and classification into terrain units was used to assess vulnerability in the vicinity of a possible Imja Tsho GLOF. Monitoring of glacial lakes in poorly accessible mountain locations using satellite-based techniques is also explored as a basis for monitoring and prioritisation of disaster mitigation efforts. GLOF mitigation measures and early warning

systems applied in the Nepal and Bhutan Himalayas are also discussed.

The study recommends refinements and adaptation to the local situation when replicating in other areas. The report will be useful for scientists, planners, and decision makers, as well as for raising the awareness of the public at large to the potential impacts of climate change in the Himalayas. While this and other activities are helping to raise awareness of the risks posed by GLOFs, it will be essential to replicate these studies and to continue to extend them systematically to include other high-risk areas in the Himalayas. There is a need for urgent action by the international community to help develop better scientific understanding of the consequences of global climate change as a basis for introducing corrective and precautionary measures before it is too late.

This book was launched by ICIMOD and UNEP on the occasion of World Environment Day 2007.

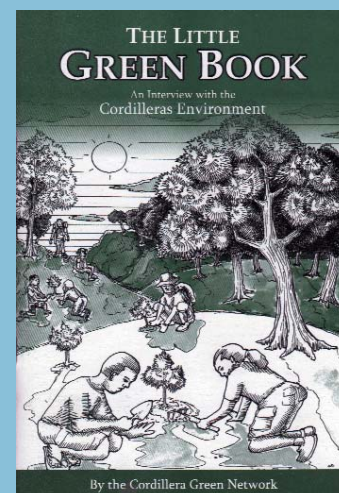
On the web:  
<http://dev.icimod.org/elibrary/index.php/search/publication/169>

### **The Little Green Book: An interview with Cordilleras Environment** – Cordillera Green Network

The Little Green Book seeks to answer basic questions about the environment of the Cordillera in the Northern Philippines. Following a question-and-answer format, it attempts to capture important and commonly asked questions about ecology and answer them briefly.

The booklet seeks to inspire Cordillera's youth to learn more about their environment. It wants to introduce young people to key facts and principles, which are no longer taken seriously. The prevailing throw away mentality and consumerist lifestyles influence even indigenous peoples long known for their traditional conservation and manage-

ment practices. By learning more, they can better appreciate the existence and role of every organism and other components of the local ecosystems, and act accordingly to help protect and sustain these for future generations.



The book is written by John Tacloy and Maurice Malanes and prefaced by Mariko Sorimachi Banasan, the Director of the Cordillera Green Network, an environmental NGO based in Northern Luzon in The Philippines. It is illustrated by Carl Belo, a freelance artist. A list of environmental organizations in the Cordillera is provided as an annex and serves as a guide for networking and collaborative activities for environmental concerns.

The book was launched during Environment Day, 2007 and was part of a month-long celebration of environmental art exhibits in the Cordillera region, especially in the City of Baguio.

*Book review contributed by Aida Pagtan, an active member of APMN/MF.*

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# Events

## Past Events

### Strategies for the Sustainable Use of Energy Resources for Villages

Energy is especially important in relation to mountain regions. The mountains of Central Asia especially represent an enormous and valuable source of energy because of their height, rough rivers, and intensive solar and wind energy. But there are also unmet needs. Securing warmth for remote mountain villages in Tajikistan, Kyrgyzstan, and Kazakhstan, is one such important need. Proposals on this topic were made by the 'Forum for Sustainable Development of Central Asian Mountain Regions: Strategies for Sustainable Use of Energy Resources for Villages', which took place in Dushanbe, Tajikistan, on November 22-24, 2006. The mission of the forum was to strengthen the network of organisations working on the sustainable development of Central Asian mountain regions, and to stimulate multi-level policy dialogue.

About 130 representatives from different organisations from Kyrgyzstan, Tajikistan, Kazakhstan, and Afghanistan promoting energy supply for mountain regions gathered together with representatives of Alpine countries to share their experiences.

The main conclusions and recommendations of the forum participants were overall to strengthen information exchange and dissemination on methods of efficient energy use and cooperation; at local level, to create energy committees and elaborate individual strategies; at state level, to elaborate a law on use of renewable energy sources; and at international level, adaptation of the best experience and education. To secure warmth in houses located deep in the mountains means to secure the warmth of the

people living in these houses, to secure the unique warmth of the whole village and the entire mountain region, and to reduce the migration of people to urban areas. At the end of the forum, exchange visits were organised to Tajik villages to illustrate the theme. The participants could choose one of four different excursions to see a straw bale house, efficient stoves, house insulation, biogas installations, or mini hydro-electric stations.

Details: <http://tinyurl.com/22bsvx>

## Upcoming Events

### 1-10 August 2007

#### Training Workshop on Flash Floods Risk Management in the Himalayas

International Centre for Integrated Mountain Development

Contact: [abshrestha@icimod.org](mailto:abshrestha@icimod.org)

URL: [www.icimod.org/webcalendar/view\\_entry.php?id=531&date=20070801](http://www.icimod.org/webcalendar/view_entry.php?id=531&date=20070801)

### 30-31 August 2007

#### Conference on Crucial Issues in Climate Change and the Kyoto Mechanisms in Asia

National University of Singapore, Singapore

URL: [www.climatefocus.com/newspubs/events/index.html](http://www.climatefocus.com/newspubs/events/index.html)

### 3-7 September 2007

#### International Symposium on Snow Science

International Glaciological Society, Moscow, Russia

Contact: [<igsoc@igsoc.org>](mailto:igsoc@igsoc.org)

URL: [www.igs-moscow.org/](http://www.igs-moscow.org/)

### 24-25 September 2007

#### National Seminar on Impact of Climate Change on Environment and Economy

Calcutta, India

Contact:

[ecoseminar2003\\_association@yahoo.co](mailto:ecoseminar2003_association@yahoo.co)

URL: <http://tinyurl.com/yv94o5>

### 16-18 October 2007

#### The Future of Forests in Asia and the Pacific: Outlook for 2020

Chiang Mai, Thailand

Contact: [patrick.durst@fao.org](mailto:patrick.durst@fao.org)

URL: [www.fao.org/forestry/site/39701/en/](http://www.fao.org/forestry/site/39701/en/)

### 22-26 October 2007

#### The 2nd Asia CliC Symposium - The State and Fate of Asian Cryosphere

WCRP-CliC Science Steering Group, China

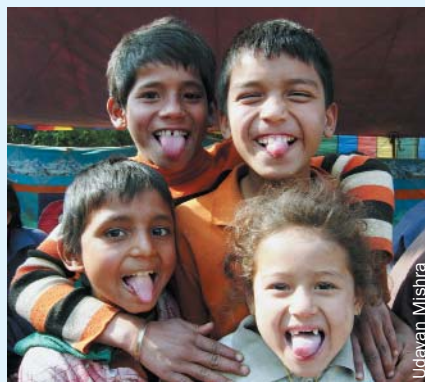
CliC Committee, Japan CliC Committee

Contact: Qin Xiang, [qinxiang@lzb.ac.cn](mailto:qinxiang@lzb.ac.cn),

Xie Aihong, [xieaih@lzb.ac.cn](mailto:xieaih@lzb.ac.cn)

URL: [www.casnw.net/clic/Asia\\_clic.html](http://www.casnw.net/clic/Asia_clic.html)

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



Chepang Kids from Dhading, Nepal

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

A. Beatrice Murray, Acting Coordinator or Udayan Mishra, Acting APMN Node Manager

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