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FOR MOUNTAINS AND PEOPLE



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EVENTS

Climate Change in the Hindu Kush-Himalayas and its Impacts on Water and Hazards

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Direct instrumental records as well as environmental proxy records indicate that historical and recent changes in the climate in many mountain regions of the world, are often greater than those observed in the adjacent lowlands. Mountains also represent unique areas for the detection of climatic change and the assessment of climate-related impacts. Actual and potential changes in climatic parameters can have strong impacts on the cryosphere: a rise of the snowline, the duration of snow cover, increases in cryogenic hazards such as ice and snow avalanche frequency, glacier recession, the formation and break-out of moraine-dammed lakes, the warming of perennially frozen ground, and thawing of ground ice. All the listed impacts of climate change in mountains have a multitude of socio-economic implications. These include direct effects of changes on water resources and hydropower generation, slope stability, and hazards relating to avalanches and glacial lakes.

Coordinator's Note

The Asia Pacific Mountain Network (APMN) is pleased to bring you the 2008 winter issue of the Bulletin. This is the third and last thematic issue on 'Climate Change and Mountain Areas of Asia Pacific'. This issue contains articles, news, interviews, and other relevant background information on this theme; we hope you will find it interesting. Again, this Bulletin would not have been possible without the constant support, voluntary contributions, and help from our APMN members and registered users. We would like to thank you for your inputs and contributions.

We are pleased that the APMN network continues to grow. There is a clear need for information on mountain development issues in the wider Asia-Pacific region, and we are glad that the communication channels of APMN (e-conferences, e-dialogue, member to member networking, and the Bulletin) are proving an effective means for dialogue. As we go to press, the APMN network has 209 organisational members from 23 countries and over 1500 individual members from 38 countries. New members register through our website on an almost daily basis.

Between May and October of this year, APMN collaborated with the Mountain Forum Secretariat and ICIMOD in the organisation of an e-conference on 'Culture and Risk', organised a successful digital photo contest on 'Mountains and People', and co-organised the south Asia regional meeting of the Global Knowledge Partnership. Further, we implemented three projects from the Mountain Partnership Secretariat on 'Biodiversity Twinning Programme between Gran Paradiso National Park, Italy and Sagarmatha National Park, Nepal', a 'Communication Needs Assessment in Central Asia', and the 'Who's Who Mapping Exercise'; and conducted e-discussions on 'Slashing Mountaineering Charges for Climbers' and 'How Disasters Can Help to Improve a Country's Economy'.

You can read more on these activities in this Bulletin. APMN is currently strengthening its relationship with partner organisations around the world, including other nodes of the Mountain Forum (MF), the Mountain Partnership Secretariat (MPS), and the Mountain Research Initiative (MRI). Recently we finalised the 'Recommendations for a Strategic Direction 2008-2012' which will help guide APMN in supporting its membership and network activities.

The APMN Bulletin serves many important functions. It informs you and other interested users about our network activities; it is a knowledge exchange platform for taking stock of discussions on new, critical and emerging themes; and it highlights membership initiatives. We welcome comments and suggestions on how to serve our members better. This is your Forum; make use of it to pass on news and information and initiate discussions on matters relevant to our common interests.

We look forward to hearing from you.

Daan Boom

One interesting characteristic of mountains is that as the climate changes rapidly with height over relatively short horizontal distances, so does vegetation and hydrology (Whiteman 2000). As a result, mountains exhibit a high biodiversity, often with sharp transitions in vegetation sequences (ecotones), and equally rapid changes from vegetation and soil to snow and ice. In addition, mountain ecosystems are often endemic, because many species remain isolated at high elevations compared to lowland vegetation communities that can occupy climatic niches spread over wider latitudinal belts. In socioeconomic terms, mountain landscapes attract large numbers of people in search of opportunities for recreation and tourism. Climate change can have profound impacts on all these aspects of mountains.

Evidence of climate change in the Hindu Kush-Himalayas

Observation records in the Hindu Kush-Himalayan (HKH) mountains are sparse and unreliable and where available are difficult to access, therefore climate change analysis in the region carries a high amount of uncertainty. Figure 1 shows a spatial distribution of temperature trends in the HKH region, based on available observation data (New et al. 2002). A major part of the sub-continent is undergoing warming at rates higher than 0.01°C/yr. Lower warming (0.01-0.03°C/yr) is observed in the western Himalayas, eastern Himalayas, and the plains of the Ganges basin. Higher warming rates (0.03-0.07°C/yr) are observed in the central Himalayas and the whole of the Tibetan Plateau. There are some pockets of very high warming in the north-eastern Tibetan Plateau, south Pakistan, and Afghanistan. The central part of the Himalayas show a south-north gradient in the warming rates. This is clearly demonstrated by the area-averaged trends of three elevation zones (<1 km, 1-4 km and >4 km) in the region (Figure 2). There are strong warming trends in all the three zones over the last one and a half decades, although the trend is higher in the >4 km zone compared to the other two zones. The warming trend in all three zones is significantly higher than the global average. In fact, the HKH region is one of the world's hotspots in terms of warming trends. On a global record, the warmest year up until 2000 was 1998; in the HKH region 1999 was the warmest year and 1998 the second warmest year.

Climate change impact mitigation and adaptation planning rely greatly on the understanding of how our climate might evolve. However, we have only limited understanding of the future climate in the region. One of the reasons for this is that the global climate models (GCMs) are too crude to resolve the intricacies at regional scales. Regional climate models (RCM) for the dynamic downscaling of GCM outputs are fairly new in the HKH and the capacity in the region to run RCMs is rather limited. This paper presents future climate scenarios based on the HadCM3 model outputs produced by the Indian Institute of Tropical Meteorology (IITM) (Rupa Kumar et al. 2006). The HadRM3 Providing REgional Climates for Impacts Studies (PRECIS) projects indicate a decrease in monsoon precipitation by up to 20% by the end of the century in most parts of Pakistan

Figure 1: **Spatial distribution of temperature trends**
(data source: New et al. 2002)

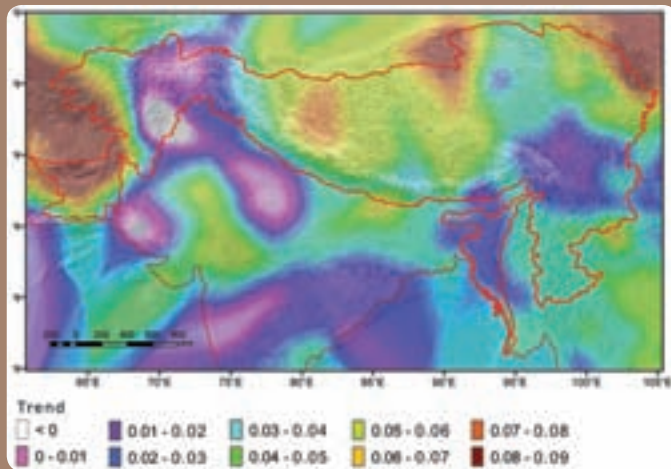
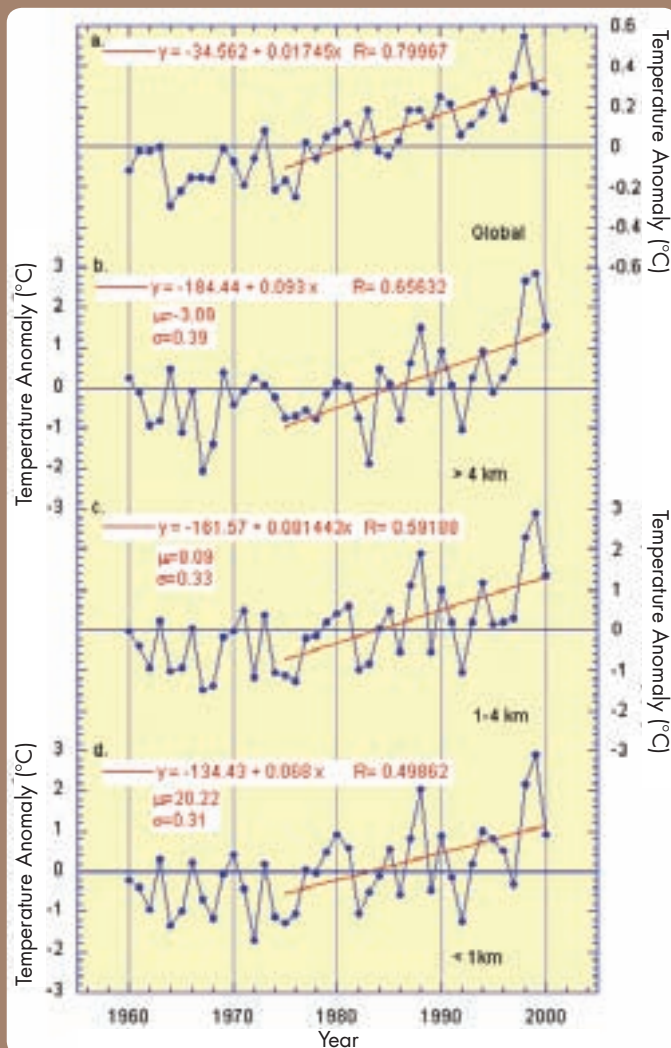
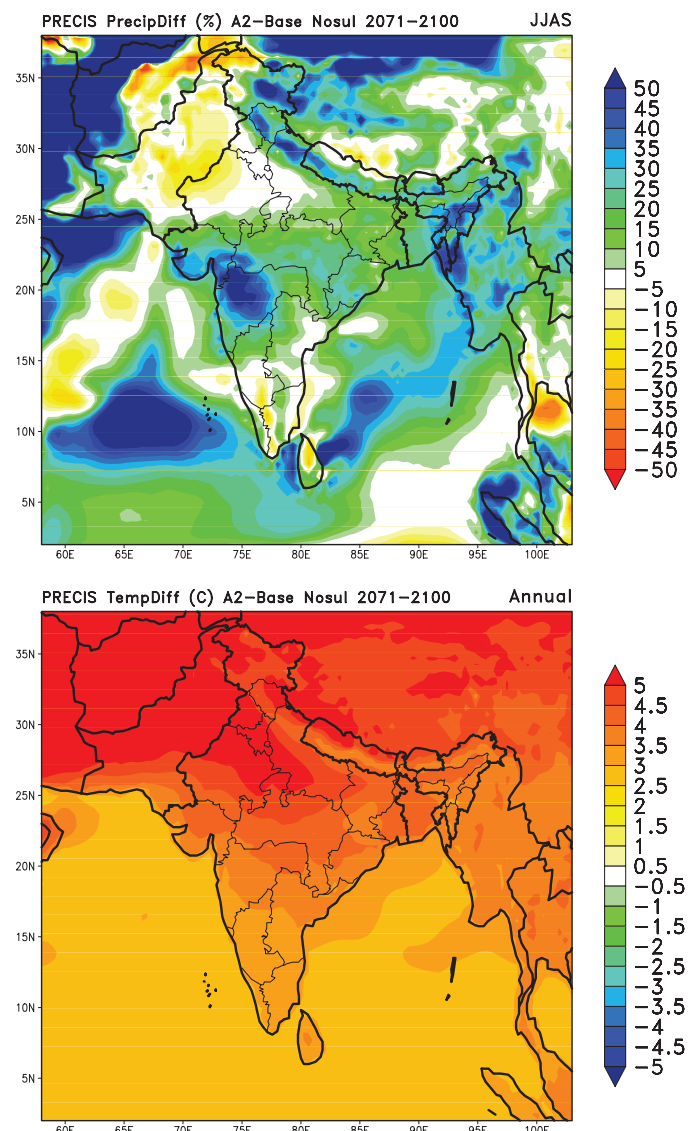


Figure 2: **Time series of annual mean temperatures:** a. global average; b. HKH above 4,000 masl; c. HKH 1,000-4,000 masl; d. below 1,000 masl (data source: New et al. 2002)



and south-eastern Afghanistan, including Badakhshan, the Hindu Kush, and the Karakoram ranges. A similar reduction in precipitation is projected for the southern and eastern Tibetan Plateau and central Himalayan range. Increases in the range of 20-30% are projected for the western Himalayan Kunlun and Tian Shan ranges. All areas of South Asia are projected to warm by at least 1°C by the end of the century. Some parts of the region are projected to experience an even higher amount of warming. High warming is projected in the Punjab area, a large part of Afghanistan, Badakhshan, western Nepal Himalaya, Himachal Pradesh, and the northern Tibetan Plateau. These areas are expected to warm by 3.5-4°C. There is a clear elevational gradient in warming rates in the Himalayan range (e.g. Bhutan, Nepal, and Himachal Pradesh) similar to that in the observed historical temperature data.

Figure 3: **Projections of changes in precipitation (top) and temperature (bottom) by the end of the century for emission scenario B2** (from Rupa Kumar et al. 2006)



Climate change and water resources

These climate scenarios can be useful in furthering the understanding of the changes that can be expected in the regional hydrology and water availability. Furthermore, the scenarios can be used to predict changes in the glacial mass in the Himalayas; an important source of water in the river basins during non-monsoon seasons. Model projections on the effect of climate change on stream flow vary regionally and between climate scenarios, largely following projected changes in precipitation. In south Asia, HadCM3 shows an increase in the annual runoff ranging from 0-150 mm/yr by the year 2050, relative to the average runoff for the period 1961-1990. These climate models are unable to highlight the details in seasonal runoff variations, although it is generally suggested that due to the higher evaporation and decrease in glacier mass, the low flows are likely to decrease (IPCC 2007). There are still no analyses of runoff variations due to climate change on smaller geographical scales.

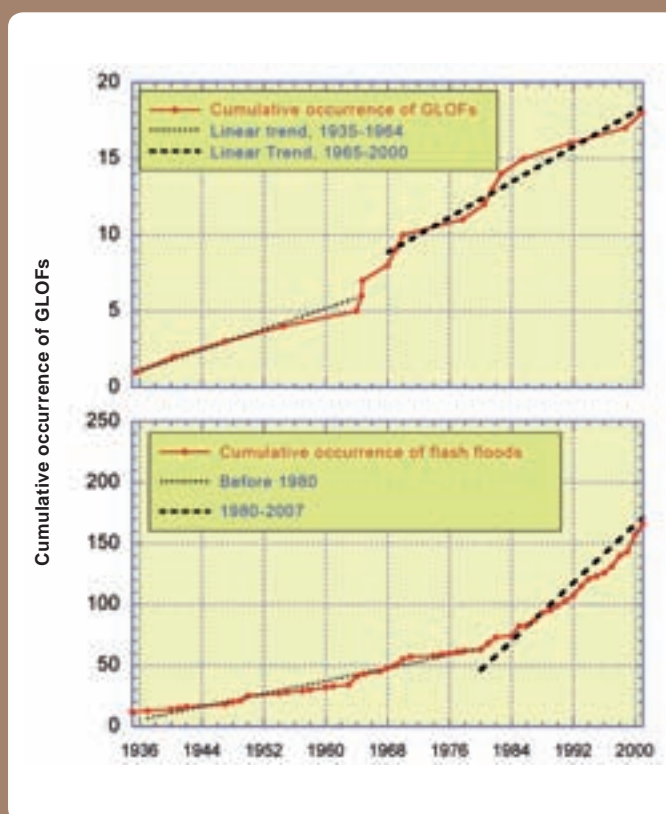
In 2001, a project called SAGARMATHA (Snow and Glacier Aspects of Water Resources Management in the Himalaya) investigated the impacts of climate change in the hydrology of the Indus, Ganges, and Brahmaputra basins. The results have shown the impacts of deglaciation to vary considerably within the region and within catchments. Highly glaciated catchments and those catchments where meltwater contributes significantly to runoff have been shown to be most vulnerable to deglaciation (Rees and Collins 2004; Sullivan et al. 2004). While the relative changes are less in winter, any variation in water availability in this traditionally dry period could have serious impacts for water users. In the monsoon dominated basins such as the Ganges, the impacts are likely to be less severe.

Climate change and hazards

One phenomenon that occurs parallel to deglaciation is the growth and ultimate outburst of moraine dammed lakes. Studies have shown that the majority of present day large moraine dammed lakes did not exist before the 1950s. These lakes started forming in the mid to late 1950s, and in the 1970s they grew in a rather rapid manner. Most of the glacial lake outburst flood (GLOF) events recorded in this region happened in the last three decades or so. There are strong indications that the GLOF frequency has increased in recent decades (Figure 4). There are over 200 potentially dangerous glacial lakes in the HKH region, which could burst out at any time (ICIMOD 2007). Under the observed and projected climate scenarios, it is very likely that the frequency of GLOF events and their magnitudes will increase.

Climate change involves, perhaps most seriously, changes in the frequency and magnitude of extreme weather events. There is widespread agreement that global warming is associated with these extreme fluctuations, particularly in combination with

Figure 4: **Cumulative occurrence of GLOFs** (top, source NEA 2004) **and flash floods** (bottom, source Xu Jianchu et al. 2007)



intensified monsoon circulations. Although many other factors are involved, the growing incidence and toll of related natural disasters, such as floods and drought, is of particular concern. In parts of central Asia, regional increases in temperature will lead to an increased probability of events such as mudflows and avalanches that could adversely affect human settlements (Iafiazova 1997). In 2007, seven of the top 10 natural disasters, by number of deaths, occurred in ICIMOD member countries, altogether accounting for 82% of the total deaths (UN/ISDR 2007). This indicates both the prevalence of disasters in the region, and the susceptibility to such events. The lack of high frequency observational data in the region hinders a comprehensive assessment of changes in extreme climatic events. Available studies suggest indications of changes in climatic patterns and an increase in extreme events. An increase in the frequency of high intensity rainfall has been observed in Nepal (Chalise and Khanal 2001). High intensity events can lead to flash floods and landslides. A recently developed database by ICIMOD suggests a steady increase in flash flood events in the region (Figure 4), which could be due to an increase in high intensity precipitation events.

Among others, the monsoon in Asia is related to large-scale climatological phenomena like El Niño and La Niña, which can lead to lower and higher than average monsoon precipitation, respectively (Dhar and Nandargi 2003). The impact of El Niño is thought to be responsible for a considerable decline in the flow of the Yellow River (Wang et al. 2006). El Niño and La

Niña are in turn influenced by climate change. The magnitude of deviation in monsoon precipitation is likely to rise, resulting in increased droughts and floods.

Another commonly perceived phenomenon in the high mountains is the shift from snow-dominated to rain-dominated precipitation. Manang in central Nepal is an example where people have experienced the poor functioning of traditional mud-roofed houses due to more frequent rains. These communities are also exposed to mudslides and flash floods (Dahal 2007).

The average climate change scenarios are unable to provide an insight into extreme climatic events, which are more important for projecting flash floods and landslides. There is also less professional capacity available in the region for projecting extreme events. Furthermore, downscaling of outputs from global climate models is of only limited use for simulating extreme events. The experiment conducted by the Indian Institute of Tropical Meteorology, as described in this paper, provided some insight into the likely changes in extreme rainfall events and predicts an increase in rainy days and an increase in the frequency of high rainfall events, particularly in the foothills of the Himalayan range. This area is highly prone to flash floods, landslides, landslide damming, and debris flows, and the frequency of flash floods has also increased dramatically in the region (Figure 4). This situation might be aggravated in the future under climate change scenarios.

In conclusion, climate change is bound to have a significant impact on water resources and hazards in the HKH region. The intricacies of climate evolution remain unknown. Effective management of climate-related stresses requires a better understanding of climate in the future. It is essential that the capacity in the field of climate modelling in the region be strengthened. Calibration and validation of climatic and impact models rely greatly on observation data, which means the density and quality of observation networks must also be improved. While these activities will take rather a long time to develop, it is essential now to explore appropriate adaptation options and steps to reduce the vulnerability of mountain people to climate-related stresses.

Figure 5: Traditional housing in Manang, Nepal



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Interview



Mr Prabhu Budhathoki, a renowned Nepali conservationist, was elected to serve as the Mountain Forum (MF) Board Member for the Asia Pacific region for three years starting from May 2008. He is currently an International Advisor for the Central Zagros Landscape Conservation Project,

UNDP, Iran; has been the Country Representative of IUCN Nepal; and is a member of the IUCN World Commission on Protected Areas (WCPA). Tek Jung Mahat of APMN had the pleasure of interviewing him in an email exchange.

Q1: Congratulations, Mr. Budhathoki. How does it feel to be a board member of MF/APMN?

I feel myself quite privileged to be elected as a board member, and I take this as a good opportunity to work for the betterment of the mountain environment and people living there.

Q2: As the APMN elected representative on the Mountain Forum board what will your responsibilities/plans be?

My key responsibility is to reflect the interests, needs, and aspirations of APMN members in the policy and programme of the Mountain Forum. In addition, I will try my best to address the voices and choices of the mountain people in national and international development policies and practices. I will also focus my efforts to help people understand better the importance of environmental services and functions of mountains including biodiversity. I will also promote inter-member communication in the region.

Q3: Have you been in touch with some of your constituencies? What are their expectations?

The AP region is very diverse and has the highest number of memberships in MF. The real success of MF depends on how best we could serve the needs of this constituency. The members of APMN want to see MF more active in knowledge sharing and proactive in emerging mountain issues. Members would also like to see the implementation of some action research activities in collaboration with individual or institutional members in the region. MF, as an umbrella network, should optimally utilise the strengths of individual and institutional members to further mountain agendas at the national, regional and international levels.

Q4: What, in your opinion, makes information dissemination in the Asia Pacific region challenging?

How do you propose APMN reaches out to the marginalised mountain communities? As I said before, this region is quite

diverse in terms of geography, culture, and socioeconomic situation. The Forum should consider how to reduce the digital divide, and cultural and language barriers so that information and knowledge can flow easily and reach the right target communities. The use of community radio, production of important documents in local languages, organising key environmental events at the local level, community exchange programmes, and the establishment of e-information centres could be some activities. The Forum can implement these activities by mobilising its members and networks. Mountain Forum's current activities are fairly successful in disseminating information among professionals and members. We need to mobilise and encourage our network members to promote the exchange of knowledge and information among themselves, between people and people, and between experts and mountain people.

Q5: What challenges did you face while working with IUCN Nepal and UN Projects in other parts of the Asia Pacific? How do you intend to apply what you learned during your IUCN years as an MF board member?

In most cases it is very difficult to convince governments and donors that environmental issues are issues of today and that environmental and developmental objectives can be achieved together. Mostly people think that mountains have a mountain of problems. Generally, development agencies try to address symptoms rather than root causes. My experience suggests that our understanding on mountain issues is mostly incomplete and sometimes wrong too. Policies and programmes targeted to conserve mountain environments are largely designed to curtail the use of resources by poor people rather than to increase their productivity and participation in resource management. The lack of effective collaboration among agencies working on mountains issues is another big hurdle. Our efforts are scattered and short term.

Through MF we should promote better knowledge on mountain issues and a coordinated and integrated approach to sustainable mountain development. We can sustain livelihood and environment if we address poverty, provide incentives, adopt appropriate technology, and promote sustainable traditional practices and participation of local people. Mainstreaming mountain environmental issues in development is the key to success. Most mountain development issues are transboundary in nature. MF should promote inter state or province collaboration and understanding.

Q6: Broadly speaking, what do you think are the most critical issues facing mountain people and mountain ecosystems everywhere, and what role can MF play to address these issues?

Mountain people are largely becoming the victims of wrong perceptions by policy makers and professionals. We think that mountain people are poor, weak, and ignorant. We generally

consider that mountains are barriers to development. We try to implement pre-conceived ideas without properly understanding the issues of the areas. Our policies often promote exploitation of mountain resources with very little incentive for their sustainable management. Mountain people are not empowered enough or getting enough opportunity to explore their potential to manage their mountains. Mountain environments and cultures are in the process of a rapid change. Mountain environments have been affected by actions taking place far beyond their boundaries. The erratic climatic phenomena will have serious impacts on mountain ecosystems and the lives of the people. How to manage these changes is crucial to achieving long-term sustainability of mountain resources, both natural and cultural. The Mountain Forum can develop public opinion to encourage government and other development agencies to give special attention to mountain issues such as climate change, poverty, resource degradation, cultural erosion, and a sustainable financing mechanism for mountain development. For example, Mountain Forum could help generate knowledge on payment of environmental services approaches (PES) and encourage national and regional policy development to support a PES mechanism. If we could just recycle a small portion, maybe 10-20%, of what countries get from mountains, the situation of the mountain regions would be completely different.

Q7: How can a global network like Mountain Forum promote the mountain agenda at the national and local level?

Mountain Forum should engage with and encourage members to work more on emerging mountain issues. MF should make more effort to promote good development practices in mountains in order to save the rich and unique biodiversity, traditions, and culture. Devolution of power and the revival of traditional resource management practices can make a big difference in sustainable mountain development. Besides what it has been doing currently, MF should consider establishing a 'mountain development fund' to support innovative activities for its members. Another possibility could be the establishment of an 'award' as a token of appreciation for its members for contributions to environment protection and the promotion of sustainable livelihood practices in mountains.

Q8: Lastly, what message do you have for our APMN members?

Mountains are not a mountain of problems but they offer mountains of opportunities if we develop our policies and practices properly. Mountains are our identity and crucial to our survival. Thus mountain issues should be at the core of our development planning. The more, and more judiciously, we invest in mountain development, the more we will benefit. Let us recognise the importance of mountains.

Mountain Highlights

Understanding Community-based Climate Change Adaptation in the Himalayas: Balancing Development and Disaster Preparedness

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Understanding adaptation

Mountain communities of the Himalayan region are highly vulnerable to climate change for two main reasons. First, there are likely to be more extreme climatic events resulting in an increased loss of lives, property, and sources of livelihood. Second, already facing a resource crisis, the communities are not in a position to afford huge costs in implementing adaptation measures, and as a result are likely to remain trapped in a vicious cycle of poverty. Indeed, the communities are already suffering from climate change-induced stresses such as a depletion of snow cover, glacier retreat, and glacial lake outburst floods. At the community level, problems like erratic rainfall patterns, water hazards, water shortage, and vector borne diseases are reported to be growing.

Understanding the changing patterns of weather, hydrology, water, vegetation, agriculture, and extreme weather events is essential to develop adaptation measures. Adaptation to adverse impacts of climate change, however, is not a simple task. 'Weather' is a highly dynamic process with complex interactions and diverse earth surfaces; an assessment of vulnerability and addressing of context specific problems are vital for prioritising adaptation measures.

Understanding climate change impacts correctly in the local context is the major challenge for planning adaptation measures. To some extent, relevant knowledge and information available at higher scales (regional or international) are useful to begin adaptation planning, if supplemented with adequate local information. The IPCC defines climate change adaptation as "An adjustment in natural or human systems in response to actual or expected climate stimuli or their effects, which moderates harm or exploits beneficial opportunities".

Climate change inevitably brings additional stresses to livelihoods and the environment. The stresses, however, are not the same for all regions and societies. Most environmental and socioeconomic problems affect the poor most, and stresses induced by climate change are likely to add to this burden, diminishing people's capacity to respond. Climate change impacts are severely felt among people in small communities, who are often the least equipped to cope and adapt. While the need for community level action is growing, a lack of successful community-based examples has hampered planning and implementing urgently needed adaptation measures.

Understanding local impacts of global warming

Efforts towards climate change adaptation should be directed towards identifying critical factors that are important in minimising climate change induced challenges for a particular community or household, and helping them to enhance their resilience so that they can respond successfully. Identification of critical factors, however, is highly context specific and involves, among others, an analysis of livelihoods and environmental issues explicit to local socioeconomic and geographic characteristics. Mountain communities not only have distinct needs and conditions, but are also in need of urgent attention to implement adaptation measures.

Temperature rise

Recent studies (Xu Jianchu et al 2007) show that Nepal's higher altitudes are warming at a higher rate than the middle hills or the Terai (0.8°C per decade compared to 0.6°C and 0.4°C respectively). The temperature rise on the Tibetan Plateau is also reported to be about 0.8°C per decade. In its 4th Assessment Report, the Inter-governmental Panel on Climate Change (IPCC) projects that rising global temperatures will cause increasing drought in mid-latitudes and semi-arid latitudes, increased water stress in many parts of the world, increased damage from storms, and coastal flooding affecting millions more people each year.

The rise in temperature has a widespread impact on glaciers, precipitation patterns, water sources, agriculture, biodiversity, health, forests, and other sources of local livelihoods. Providing details of each of the topics is beyond the scope of this short paper, therefore only a few relevant cases are discussed.

Disappearing glaciers

Fast receding glaciers from the Himalayas will have alarming impacts on flow levels in all the major tributaries of the Ganges river with severe implications for the downstream water on which more than one billion people depend. Hundreds of newly formed and expanding glacial lakes at high altitudes threaten downstream settlements and expensive infrastructure, as they are likely to breach their geologically weak dams that are formed from moraine. In the past, there have been several cases of glacial lake outburst floods (GLOFs) in Nepal, inflicting huge damage to downstream settlements and infrastructure. An ICIMOD study (ICIMOD 2000) identified 20 lakes in the Nepal Himalayas that are potentially unstable and recommended action for implementing mitigation measures.

Fewer rainy days

Although mean annual rainfall and snowfall quantities remain unaltered, a significant change in precipitation has been observed in mountain regions of Nepal. A steady decline in the number of rainy days has been observed in major meteorological stations including Kathmandu. Farmers of Kaski,

Lamjung, Dhading, Kathmandu, Okhaldhunga, and Ilam have experienced more heavy downpours of short duration in recent monsoons. According to them, this is in contrast to past years when lighter rain of longer duration, usually one to three days (jhari barsa), used to be a common feature. A direct impact of the reduced number of rainy days is the reduced recharge of groundwater. As a result, spring sources are not restored fully during the monsoon and are drying out earlier than in the past. The springs are critically important for sustaining mountain livelihoods as they provide both domestic and irrigation water supplies. At the same time, the increased amount of stormy rain leads to erosion and damage to standing crops. The collective impact of these changes results in a loss of agricultural productivity and additional hardship to hill farmers.

Multiple stresses on high mountain dwellers

Unusual precipitation is evident in high mountain villages. In the Mustang and Manang districts of Nepal, people are experiencing rain in summer when they used to have several months of dry weather. In contrast, they receive less snowfall in winter. Both of these changes have negative impacts on their livelihoods. The walls and roofs of the traditional mud-built houses are eroding fast due to the rains. According to local residents, they are trying to cope with the problem by repairing the damaged parts of the houses but it is not helping them much. They feel that in the future their roofing design may need to change to protect themselves from rain. For them, a drier winter means inadequate snow deposits for water supply during post winter and summer seasons. There is a growing concern for water as their traditional irrigation sources are snow-melt springs.

Another issue of local concern is the increased number of stormy snowfall events. These storms usually lead to damaged crops and livestock. There are cases of severe flooding that have led to seriously damaged settlements, roads, and bridges. Death of livestock due to avalanches triggered by heavy snowfall is also a serious concern.

Identification of community-based adaptation measures

Coping with multiple climate change induced stresses requires both long-term planning and short-term adaptive measures. As mountain people are more exposed to climate change induced hazards, they have already experienced hardships to their livelihoods from multiple fronts. As the majority of mountain households depend on natural resources and subsistence farming practices for their livelihoods, they are the most vulnerable groups from a climate change perspective. For example with declining water supplies at local streams and spring sources as a result of the reduced number of days with rainfall, and substantially increased time and costs for fetching water supplies. In this case a good adaptive measure to climate change impact can be helping local communities with appropriate technologies and skills for efficient water management.

Loss of grass productivity due to alien invasive species is another issue of concern in the mid hills. Diseases in fodder trees are also reported more frequently in recent years. People from high mountain regions have serious concerns over the declining grassland productivity. They link the problem with moisture deficiency as they have noticed disappearing winter snowfall and increased wind intensity. Harvesting the stormy precipitation that they receive in winter or post winter months might be an option. In the context of growing uncertainties in the rainfall pattern, (more intense rains, longer droughts leading to reduced supply of water for irrigation) it is reported that in recent years mountain farmers have to bear additional costs to produce the same amount of grain. In response to the growing water concerns, farmers tend to look at different types of crops that can survive the drought and can be harvested earlier. They also seek support to harvest water for irrigation and off-season farming. In the climate change literature, these examples are usually categorised as options for community-based adaptation (CBA). This begins by identifying communities most vulnerable to climate change. These communities are generally very poor and depend on natural resources but occupy areas already prone to natural hazards such as floods and droughts. Gaining the trust of the local communities, identifying appropriate adaptation options, and building on existing community capacity, knowledge, and practices are the follow up steps. The introduction of an adaptation measure helps the community to understand the climate change risks and associated factors, as a result converting their knowledge and skills into actions.

The importance of synchronising disaster preparedness and development practices

Though capacity building is mentioned as the common answer to climate change challenges, it requires redefining in the context of the specific needs of target communities. A reorientation of regular socioeconomic development activities with a climate change sensitive approach is one way of incorporating climate change components in the capacity building process. Another approach is climate change sensitive disaster preparedness planning that also helps achieve the adaptation goal. The combination of disaster preparedness and good development practices can be an effective way of planning adaptation.

Six important programme components for reducing climate change stresses of mountain communities are drawn based on successful local practices carried out in Nepal:

- Raising awareness among community members on potential impacts of climate change on their livelihood sources through a participatory approach
- Assessing the vulnerability to climate change hazards
- Exploring the options and challenges for sources of income diversification in individual households
- Application of appropriate technologies, skills, institutions, networks, and other relevant resources for livelihood enhancement
- Participatory monitoring of climate change patterns, water sources, crop productivity, forest-based resources including biodiversity, and natural hazards as experienced in and around the community
- Implementation of disaster preparedness and climate change sensitive development practices

These activities are neither new nor exclusive for a good development project or disaster preparedness plan. Orientation of local development plans and disaster preparedness schemes towards emerging climate change challenges would serve the purpose at the local level. However, the scope of climate change related work is much larger than that of other schemes.

Conclusions

Climate change has further exposed the vulnerability of mountain communities. The limited understanding of the uncertainties and complexities of the climate change process is possibly the biggest challenge for planning a response mechanism. Those with limited access to livelihood options and directly dependent on natural resources are more vulnerable than others. Though there is no fool-proof approach to address these inherent challenges of mountain people, an approach built on both local knowledge and modern scientific findings would probably offer the best answer. Community-based climate change adaptation planning is one such approach that identifies local knowledge and skills relevant to address climate-induced challenges and seeks to supplement the knowledge with contemporary scientific information and tools. Common steps involved in planning community level adaptation schemes include i) an assessment of impact and vulnerability, ii) potential schemes for pilot demonstrations, iii) bridging knowledge gaps through the dissemination of relevant scientific information, and iv) prioritising areas for immediate action such as mitigating risks associated with GLOFs. These activities are performed through the active participation of stakeholders. Studies and assessments of measures for adaptation are an essential part of the community based adaptation planning, which is actually a 'learning by doing' process.

References

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- Yan Zhaoli; Xu Jianchu (2008) 'Climate change impacts on China's biodiversity conservation and their implications in protected area management'. In Bajracharya SB; Dahal N (editors) *Shifting paradigms of protected area management*, pp 46-53. Kathmandu: National Trust for Nature Conservation

APMN News

Summary of key activities May – October 2008

Completion of projects to support the Mountain Partnership Secretariat (June 2008)

- Communication needs assessment in the Central Asian region
- Support to MP Biodiversity Conservation Initiative. More information available online at <<http://apmn.icimod.org/bdinitiative>>
- Who's who mapping of organisations in sustainable mountain development

Coorganisation of meetings, e-conferences, e-discussions

- E-conference on 'Culture and risk: Understanding the socio-cultural settings that influence risk from natural hazards' from 22 September to 5 October 2008, together with ICIMOD, MFS, Stockholm Environment Institute (SEI) and Sida. More information available online at <<http://www.mountainforum.org/rs/ec/index.cfm?econfid=16>>
- E-discussion on 'How disasters can help to improve a country's economy' from 7-28 July. The report is available on the APMN website.
- Global Knowledge Partnership (GKP) South Asia Meeting from 18-19 June 2008, together with ICIMOD, Mountain Forum Secretariat (MFS), Panos South Asia, Forum for Information Technology (FIT) Nepal, High Level Commission for Information Technology (HLCIT), National Information Technology Centre Nepal (NITC), Bellanet and One World South Asia. More information available online at <http://www.globalknowledge.org/gkps_portal/newsmaster.cfm?&menuid=2&action=view&retrieveid=633>
- E-discussion on 'Slashing mountaineering charge for climbers' 2-6 May 2008

Outreach and network activities

- The APMN Node Manager attended the 3rd International Conference on e-Content & Sustainability (ICONECS) and Manthan Award South Asia 2008 in New Delhi, India 16-18 October 2008
- Brief presentation on 'Endeavours and achievements of Mountain Forum/APMN' at the launch meet of the High Himalaya Forum, on invitation from the organiser, PRAGYA, a development organisation based in India, and partnership meetings with One World South Asia (OWSA)/GKP members and the Centre for Environmental Education (CEE) in New Delhi, India 12-15 October 2008
- Presentation on the 'Role of knowledge networks in addressing climate change issues in mountain areas: Lessons learned – APMN' at the Climate Talk programme

on 19 September 2008, on invitation from Nepal Youth for Climate Action and other organisers at the ENPHO Resource Centre, Kathmandu, Nepal

- Mr. Mahat nominated as Associate Member (expert member) of the Nepal Forum of Environmental Journalists (NEFEJ) on 13 August 2008. NEFEJ is an APMN/MF member from Nepal.
- Partnership meeting with the Mountain Research Initiative (MRI) at its central office in Berne, Switzerland, 7-8 August 2008, and discussion of collaboration between APMN/Mountain Forum and MRI.
- Mr. Mahat together with APMN/MF members Dr Gulzat Kokoeva (Kyrgyzstan), Dr Pankaj Thapa (Bhutan), Dr PS Negi (India), Mr KM Jakeer Hussein (Bangladesh), Ms Pratima Shrestha (Nepal), Ms Saima Siddiqui (Pakistan) and Ms Shideh Atri (Iran) attended the International Programme for Education and Training on Sustainable Management of Mountain Areas (IPROMO) course on 'Mountain Environment and Global Change' 21 July - 06 August 2008 in Turin, Italy. The programme was facilitated by ICIMOD/APMN and a discussion on further collaboration is in progress.
- APMN/ICIMOD celebrated World Environment Day 2008 with the theme 'Kick the Habit! Towards a Low Carbon Economy'. Publications were shared at the event in Kathmandu, organised by the Government of Nepal and at the main event in Wellington, New Zealand, with support from UNEP Bangkok and ICIMOD.
- Mr. Mahat and Mr. Daan Boom, APMN coordinator, attended the Mountain Forum's Annual Board and Node Managers' meetings in Chambéry, France, from 27-31 May 2008. The meeting was also attended by representatives of Mountain Forum's partner organisations – TMI, Banff, CIP-CONDESAN, AHI, ICIMOD, MRI, MRD FAO/MPS, GMP, UNEP, and SDC – and provided directions for Mountain Forum for the next four years.
- Participation in the log-frame exercise of the Mountain Partnership Secretariat organised in Chambéry, France 25-26 May 2008. APMN provided inputs and assurances of cooperation as an implementing partner of the newly established MPS decentralised hub for the Asia Pacific region.

Publications

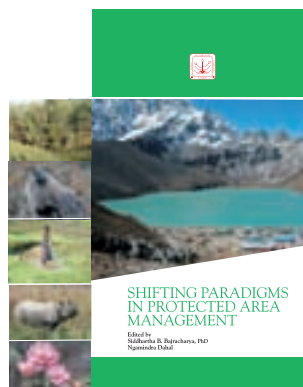
- APMN Bulletin Vol 9 No 1 (Summer 2008)
- Synthesis of the e-discussion on 'Building resilience of mountain communities to climate change' (May 2008)
- Summary of the e-discussion on 'Can disasters help to improve a country's economy?' (December 2008)

Book Review

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Shifting Paradigms in Protected Area Management

Dr Siddhartha B Bajracharya and Mr Ngamindra Dahal, editors.
Kathmandu: National Trust for Nature Conservation (NTNC). 2008.
viii+230 pp. ISBN: 978-9937-2-0362-3
Free download at <http://www.ntnc.org.np>



Protected Areas (PAs), the harbours of great biological richness, are important tools for the conservation of biological diversity and cornerstones of sustainable development strategies. The critical role of PAs is currently being challenged by numerous threats including the interactions among complex processes in diverse geophysical and

climatic settings, further compounded by climate change. Despite numerous efforts, questions like "Why are PAs not achieving their objectives?" and "How to respond to the growing concern?" have remained unanswered. In order to address these provocative questions, and emphasising the integrated management of PAs, the National Trust for Nature Conservation (NTNC) has published the book 'Shifting Paradigms in Protected Areas Management', edited by Dr Siddhartha B Bajracharya and Mr Ngamindra Dahal. The book is the outcome of the deliberations of the more than 125 participants from national and international institutions at a regional conference on 'Managing Protected Areas: Shifting Paradigm' held in Kathmandu, Nepal from 22-25 April 2007. This book showcases 20 papers from these experts divided into three thematic areas.

One of the main papers in the thematic area 'Ecosystem Management' by Jeffrey A McNeely, Chief Scientist, IUCN, Switzerland, discusses the need for a shifting paradigm in the area of sustainable management of natural resources so that they can continue to meet the needs of people through the 21st century. The paper highlights the need for more efforts to build support from local communities for PA management; the key is to find a balance among the competing demands and requires site-specific solutions. Building on the pilot initiative on transboundary biodiversity management in the Kanchenjunga landscape and the challenges, the paper highlights the evolution and gradual shift in the conservation paradigm, integrating many global conventions and directives. The papers have also presented how different initiatives set the stage for formulation of a 'Regional Cooperation Framework', which led to the development of a regional strategy for biodiversity conservation and management. Another paper presents the synergic partnership as the key to success for organisations sharing common goals, which brings a multi-skills approach for

sustainability, biodiversity conservation, and poverty alleviation by introducing participatory approaches and a proper system of governance. Some papers present the threatened situation of PAs from the immediate and possible consequences of climate change while others papers present some clear facts on climate change and the potential impact on biodiversity conservation.

The papers in the 'Governance in Protected Area Management' theme highlight the need for paradigm shifts in national and international policies with more focus on mountain PAs. The papers also try to link the 'tangibles' and 'intangibles' as knowledge systems and figure out an appropriate integration between the two. One of the papers highlights the necessity to systematically protect and conserve biodiversity with their values extending to the global level. Another presents a case on how grassroots-level people are dealing with global changes through cultural landscape management. Furthermore, the papers try to make readers aware of the need to prepare local people to cope with the consequences arising from development work and the necessity of a paradigm shift in national development activities and international cooperation to maintain a sustainable environment preserving the culture, and highlight the effectiveness of a new approach to PA management.

The theme 'Economic Tools for Biodiversity Conservation' interlinks the economic tools and various forms of payment for environmental services, while supporting livelihoods and keeping governance at the top of the agenda. One of the papers presents a concept for creating voluntary carbon markets for promoting sustainable forest management by linking forest management with economic initiatives. A case study on Shivapuri National Park analyses the costs and benefits associated with the park, and assesses different management scenarios to discover a more efficient management option that maximises the total benefits. One of the papers sees PA management and conservation activities as complex issues, and interlinks PA management with political, socioeconomic, and natural functions and presents geographical information systems (GIS) and remote sensing tools as the essential tools to provide a spatial insight into these activities.

Although very useful, the book does have some limitations. A more complete discussion of ecosystem management in a highly polarised political environment, such as in south Asia, could have described a range of current approaches for collaborative problem solving. Our PAs and ecologically critical areas (ECAs) need high profile models where science helps people to understand, value, and maintain biodiversity. The subjects 'protected areas' and 'biological diversity' are very different, and display diversity themselves with problems of compatibility in their approaches and conclusions (Di Castri and Younès 1990). Moreover, the rapid loss of the wealth of biodiversity is putting at risk the very foundation of human society, which also needs to be looked at in detail for the successful implementation of new paradigms in protected area management.

Events

Past Events

International Programme for Education and Training on Sustainable Management of Mountain Areas (IPROMO)

IPROMO is a joint initiative of UNESCO Decade of Education for Sustainable Development (DESD), FAO-Mountain Partnership Secretariat (MPS), University of Turin, Faculty of Agriculture, Department of Protection of Agro-forestry Resources - DIVAPRA (leading organisation), Piedmont Region - Mountain Directorate, Vercelli Province, Natural Park Alta Valsesia, Comunità Montana Valsesia, Comune di Alagna Valsesia, Club Alpino Italiano (Sezione di Varallo Sesia) and some local agencies based in Italy. The programme started in 2008 with the first postgraduate course on 'Mountain Environment and Global Change'. This course ran from 23 July to 6 August 2008 and was held mainly at a research station based on Mount Rosa (Piedmont region, Italy). This programme is also linked to the UNESCO Decade of Education for Sustainable Development (DESD).

There were 27 trainees; the majority from developing countries and representing different ministries, educational institutions, missions, and I/NGOs. The course presenters brought knowledge on global change (mainly climate change and land use change) in mountain areas, they were mainly from universities and research institutions, development organisations, and local communities (witnesses). Seven of the participants were from the Asia Pacific region, all of them members of Asia Pacific Mountain Network (APMN)/Mountain Forum (MF). More information is available from <<http://www.ipromo-school.it/en/course.html>>.

Upcoming Events

4-7 February 2009

4th World Congress on Conservation Agriculture
New Delhi, India

Contact: wccagri@gmail.com

More information: <http://www.icar.org.in/wccagri/index.html>

26-28 February 2009

Cities at Risk: Developing Adaptive Capacity for Climate Change in Asia's Coastal Megacities

Bangkok, Thailand

Contact: fuchsr@EastWestCenter.org

More information: http://www.start.org/Program/cities_at_risk.html

16-22 March 2009

5th World Water Forum: Bridging Divides for Water
Istanbul, Turkey

Contact: info@worldwaterforum5.org

More information: <http://www.worldwaterforum5.org/index.php?id=1870&L=0>

21-24 April 2009

Regional Seminar on Energy and Climate Change in the Hindu Kush-Himalayas and Central Asia

Leh, Jammu & Kashmir, India

Deadline for abstracts: 15.1.2009

Contact: v.stauffer@geres.eu info.india@geres.eu

More information: <http://india.geres.eu/>

26-29 May 2009

Conference on Asia Pacific Climate Risk and Adaptation
Beijing, China

Contact: chanp@imsg.com

More information: <http://asiapacificclimate.org/index.html>

28-30 June 2009

International Conference on Water, Environment, Energy and Society

Agra, India

Deadline for abstracts: 31.5.2009

Contact: wees09@yahoo.com

More information: <http://www.environment-societyyisa.org>

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Write to: apmn@mtnforum.org

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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:

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