

Session II
**Securing Sustainable Use
of Mountain Resources**

Chair: Mr Peter Gueller

Keynote Paper – Securing Sustainable Use of Mountain Resources

Mr Phrang Roy, Assistant President, Asia Pacific, IFAD¹

It is an honour and a privilege for me, and for the International Fund for Agricultural Development (IFAD), to share with you some of our insights on the theme of this working session: Securing Sustainable Use of Mountain Resources in the Hindu Kush-Himalayas.

At the Millennium Summit of September 2000, world leaders committed to halving the proportion of poor and hungry by 2015. They also pledged, in the UN Millennium Declaration, to achieve other Millennium Development Goals encompassing education, gender equality and women's empowerment, health and communicable diseases, and environmental sustainability. IFAD in its Rural Poverty Report 2001 argued that, to be successful, poverty reduction policies must focus on rural areas, where 75% of the poor work and live, and where more than 50% are expected to continue to do so even by 2025. Within rural areas, our work, particularly in Asia and Latin America, has focused on the less-favoured rural areas and on the most disadvantaged sections of the rural poor (mainly women, the landless, and indigenous peoples).

From this perspective, the Hindu-Kush Himalayan region has become particularly important and ICIMOD is a very crucial institution for us. There is now a growing awareness among policy makers and funding agencies that the historical marginality of mountain areas is largely a function of our own ignorance as to the magnitude of their true worth. Moreover, the people of these areas, especially the indigenous peoples, are indeed the 'stewards' of upland and mountain resources and biodiversity. The strong ethnic bonds of the indigenous peoples, their powerful sense of identity, and their world view, which places a premium on the higher position of women and traditional knowledge of ecosystem management and technologies, medicinal plants, and local crops, are increasingly attracting the attention of the international community. Yet these are the areas, and the people, that tend to be neglected. They have been the hardest hit by the process of de facto exclusion and marginalisation.

It is, therefore, not surprising that whatever development assistance upland populations have received has been guided by the primary concerns of the lowlands and mainstream societies. The uplands and mountain areas do have attractive assets, but past efforts to exploit their comparative advantages have tended to dispossess local populations. For example, environmental services such as controlled hydrological flows and the preservation of biodiversity are often taken from them without any compensation. The current process of globalisation, in the context of weak property rights of mountain people, could even enhance the risk of further marginalisation. I

¹Most of the content of this speech was based on my work and earlier papers with Ganesh Thapa, Raghav Gaiha, Dev Nathan, and Govind Kelkar in the context of IFAD's Assessment of Rural Poverty in the Asia and Pacific Region.

think that we should bear this setting in mind as we discuss the theme of securing the sustainable use of mountain resources in the Hindu Kush-Himalayas.

In many mountain areas of Asia, the rural poor generally rely for their livelihood security on common pool resources (CPR) available through open-access systems. Examples include water for irrigation, forests, rangelands, fisheries, and wildlife. The role of these commons in the coping strategies of the poor has become conventional wisdom since the pioneering analysis by Dr Jodha and the research work of ICIMOD itself. When we sit down to discuss our future directions for securing sustainable livelihoods of the poor people of the Hindu Kush-Himalayas, there are certain important questions that we must ask ourselves. Firstly, can the commons truly be avenues for enhancing livelihoods beyond mere survival? Secondly, what safeguards must be introduced to ensure that the poor have access to the commons in the context of increasing privatisation and state control?

In recent years, there has been an increasing trend towards the devolution of control over natural resources from central governments to local communities. Unfortunately, the emphasis of such devolution has been the sustainability of resources to be used by all, rather than poverty reduction through the securing of livelihoods for the poor. IFAD provided funding to the Centre for International Forestry Research for an analysis of various Asian experiences of the devolution of forest management. The conclusion was that the decentralisation of forest management in many parts of Asia has been dominated by the agenda of either forest departments or local elites. The emphasis on timber production and logging, and the participation of local elites, has left very little space for the livelihood needs of poorer households.

A second problem with the commons is that, today, they are almost always open to everyone without regulation or restriction. In many places, the traditional checks and balances used by communities have been forgotten. As a result, many rangelands, water-bodies, and forests are heavily degraded or sub-optimally used due to lack of investment, either in infrastructure, or in yield enhancement.

One popular approach to resolving the dilemma of open-access or unregulated commons has been to privatise these resources, often by leasing them to the highest bidder. Examples include water-bodies and lakes in Bangladesh. In India, there have been frequent proposals to allocate 'wastelands' to corporations willing to develop them. Unfortunately, such approaches deprive the poor of their traditional livelihood resources, without necessarily providing alternatives such as wage employment.

IFAD has experimented with a range of approaches aimed at enhancing the access of the poor to CPRs and improving their productivity. For example, in the Oxbow Lakes Small-Scale Fishermen Project in Bangladesh and in the Hills Leasehold Forestry and Forage Development Project here in Nepal, CPRs (lakes and degraded forests, respectively) were leased to the poorest people in the surrounding villages.

In the Oxbow Lakes Project, adequate investment support from IFAD allowed the formerly landless labourers and poor fishers to raise their incomes to the level of middle farmers in the community. Smaller fishponds, leased to groups of women, also contributed both to income increases and the enhancement of their overall status within the family and in society.

In the case of the Nepal project, the hill slopes were used mainly to grow fodder. This generated substantial livelihood benefits for the poor, including women. We found that secure rights and long-term tenure not only secures sustainable security for the poor but also enhances their transformational role as owners and managers of a CPR. Interestingly, we also found that this can stimulate innovation.

An evaluation of the Oxbow Lakes Project in Bangladesh compared the situation of traditional fishers with those who were given long-term tenure rights under the project. The evaluation exercise found that the former had very limited knowledge of stocking systems and management regimes, while the latter were well informed on ways to increase the productivity of their lakes. Moreover, as the fisher-managers were claimants of the residual income, some of them even improved on the stocking and harvesting systems that the project taught them. By 'over-stocking' and harvesting the fish at smaller sizes, the fishers of Marufdia Baor (Bangladesh) increased the number of harvests, reduced the turnover time of borrowed capital, and increased the frequency at which fish mass was at, or close to, the lake's carrying capacity. This ability to innovate was clearly the result of promoting the agency of the fishers as managers of the resource (I am grateful to Dev Nathan, IFAD consultant for this insight). As the fishers were the sole claimants of the residual income, they had a strong incentive to boost productivity through practice (learning by doing). They even learned to match stocking densities, fish growth, and carrying capacity and became more knowledgeable than the experts. Such innovations clearly show how the poor can work out ways to maximise their livelihood security from the capital transferred through projects. I am sure that many of you have come across similar experiences and it will be interesting to share them during this working session.

In IFAD we found 'social fencing', developed through the promotion of group or community-based approaches, to be an effective tool to develop and enforce local systems of sanctions, as well as to foster equity by linking benefits (income) to labour and other contributions. At the same time, investment support is needed to raise productivity, and as a result, income. Without institutional reforms to turn open-access CPRs into common property, investment will not fructify, and thus will not be made. Without investment support, the return will not be sufficient to make the transaction (and other) costs involved in developing CPRs worthwhile. A two-pronged approach, involving both institutional change and capacity building, would ensure that the poor have the incentives, as well as the ability, to develop and manage their own resources. However, in order to sustain these efforts, they also need strong organisation and systems of reasonably good governance.

In the past, development strategies in Asia tended to concentrate on irrigated and high-potential areas, in order to expand the food supply, stimulate growth, and reduce poverty. Green Revolution technologies – based on high-yielding varieties of cereal crops, irrigation, and chemical fertilisers – increased food grain production in South Asian countries in the 1970s and 1980s, mainly through productivity growth. By keeping food prices down and employment up, the technology contributed to employment generation and rural poverty reduction in many countries in the sub-region. However, there has been little progress in developing appropriate technologies for less favoured areas, e.g., dry lands, uplands, and mountainous areas.

Food prices in these areas will therefore tend to fall much more slowly, and the competitiveness of labour will thus remain low, especially with all the comparative disadvantages of these areas. It is very important that we remind ourselves of the importance of investing in the higher productivity of staple foods in the upland and mountain areas by addressing the production constraints of resource-poor farmers in the more fragile and low potential areas. This argument is further reinforced by highly favourable production effects and the absence of a trade-off between poverty reduction and higher production in these resource-poor regions.

In a study based on Indian data (Fan and Hazell 2000), districts were divided into irrigated, and high and low potential rainfed areas. The study concluded that for every investment, the highest marginal impact on production and poverty reduction occurs in rainfed areas, while irrigated areas ranked second or last. The study also found that roads not only contribute directly to agricultural production, but also influence the adoption of high-yielding varieties and investment in irrigation, variables that in turn also have an impact on agricultural production. Further, the study found that technology and infrastructure variables have an impact on rural poverty (i.e., the head-count index) through their effect on agricultural production, wage rates, and terms of trade. IFAD has therefore accorded high priority to the development of less-favoured areas.

Where agriculture dominates livelihoods, land for women is extremely important. However, the specificities of these areas and their populations call for innovative programme design and implementation arrangements. The development of appropriate technologies to enhance productivity in less favoured areas, such as the uplands and mountainous areas, must be given a very high priority. Due to the wide diversity of these areas, priority must be given to the development and application of decentralised, participatory, and iterative approaches to programme design and implementation.

Given the limitations of high-input agriculture and organic farming in mountain areas, sustainable or regenerative agriculture holds enormous promise for yield increases and environmental protection. Sustainable or regenerative agriculture involves the identification, development, and establishment of resource-conserving technologies that either conserve or improve existing on-farm resources (e.g., nutrients, pest predators, water, and soils), or introduce new elements (e.g., nitrogen-fixing crops,

agroforestry, water harvesting structures, new predators). Until recently, few had realised the potential of a regenerative or sustainable agriculture that is situated somewhere between organic and very high input agriculture (Pretty 1995).

It is quite clear today that direct agricultural income alone will not be able to secure the livelihoods of the upland poor because of their small landholdings and the seasonality of agricultural income and wages. Non-farm sources are needed and are a lucrative source of supplementary income and employment for the upland poor. In particular, they are an independent source of income for women. Non-farm sources also benefit agriculture through strong inter-sectoral linkages.

As agricultural income rises, it feeds into a higher demand for non-farm goods produced locally or in neighbouring villages/towns. Many studies indicate that rural non-farm sector growth, based on growth linkages to successful farmers and their employees, who demand booming services (construction, trade, and transport), has a better chance of cutting poverty (IFAD 2001). However, we must recognise that traditional rural non-farm sector participation often reflects family skills, land shortage, or the need to diversify against seasonal employment or annual drought risk. Moreover, as most rural non-farm activities involve little capital and more employment per unit of capital, they are very much suited to the requirements of many poor rural households.

How can institutions be made to function in the interest of the poor and women? It could be done, if we recognise and facilitate the process of collective action in matters such as the management of community owned resources. This involves supporting decentralisation initiatives to bring decision making closer to the rural poor and women, promoting community-initiated rules of governance, supporting self-help groups, and working with civil society in general to create enabling conditions for the poor to help themselves. For us, microfinance and self-help groups are instruments with the potential to build local institutions and to empower the poor, especially women.

In the past, rural financial institutions failed to recognise that rural households need access to deposit or savings accounts that give reasonable returns. IFAD has been strongly supporting microfinance initiatives throughout Asia. We have come to realise that the poor also need savings services, basic insurance options, and affordable remittance systems, not just loans.

Regular savings is promoted as a habit, and for poor women and for their households who are not accustomed to savings, this is a new way of life. Developing the capacity for individual savings fosters self reliance. In a recent study in an IFAD funded project in Bangladesh, it was shown that, interestingly, saving services are helping poor people to develop attitudes and practices necessary for subsistence economies to shift to economies based on accumulation and a strong savings ethics. We have also observed that women have internalised this shift, from subsistence to savings, and thus to an accumulation mode, much more than men.

Any future direction for securing the sustainable livelihoods of the Hindu Kush-Himalayas must therefore ensure the enhancement of women as agents of change in changing gender roles and in playing a role in community affairs (i.e., rebuilding societies with greater social and economic justice).

Strengthening institutions also means pursuing a delicate balance between the rich and the poor, as most conventional institutions are dominated by the rich. The Oxbow Lakes Small-Scale Fishermen Project in Bangladesh and the Hills Leasehold Forestry and Forage Development Project in Nepal are indeed examples of the successful redistribution of community assets to coalitions of the poor. We also found that targeting marginal groups did not produce positive results unless the agreement of the whole community was secured.

However, while doing all of this, we also need to specifically target vulnerable and disadvantaged groups, especially those who are persistently poor. Despite limited options, redistributive land reforms must remain on the policy agenda.

It is perhaps useful to remind ourselves that many of the member states of ICIMOD have been involved in implementing anti-poverty programmes, such as targeted food supplies, that are no less difficult than redistributive land reforms (Bardhan 1996).

We have dwelt on the importance of non-farm activities in both augmenting and stabilising livelihoods. We have, however, to relate this to the growing process of globalisation and its likely impact on these remote areas. We need to strive strategically to shape this local-global intersect in the best interests of the poor and the marginalised. The vulnerability of poor areas and people to different livelihood shocks has never been seriously considered, resulting in inadequate measures to safeguard such people. Therefore, building the capacity of the Hindu Kush-Himalayan region, to be able to negotiate strategically the public-private-community partnership in the emerging process of globalisation, is perhaps the biggest challenge of the coming years. This is a niche area in which ICIMOD, in collaboration with other like-minded partners, should try to become a centre for excellence.

However, we will not be able to enhance the livelihoods of the poor in an environment of conflict, in an area of rising inequality and persistent poverty, and where various forms of exploitation and social injustice continue to thrive. Conflict leads to a breakdown of the social capital of communities. It disrupts the earlier forms of economic production and blocks new avenues of investment. Suddenly, simple acts of production and trade become heroic acts. We must all play our little roles to promote peace in the region, but we will be able to yield results only if we are willing to tackle the fundamental socioeconomic conditions of economic exploitation and social exclusion. Peace cannot be simply the absence of conflict or the elimination of the fear of physical violence. Secure peace must include the promotion of social justice, human rights, and the elimination of unequal power and development relations. A rights-based approach that is willing to adjust to the changing times, must therefore be one of the distinctive features of a pro-poor strategy to secure sustainable livelihoods in the Hindu Kush-Himalayas.

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Panel Topic – Integrated Water Resources Management in the Ganges, Brahmaputra, and Meghna River Basins in South Asia: The Potential and Need for Regional Cooperation

Mr Quamrul Islam Siddique, Chairperson, Global Water Partnership, South Asia and Chairman, Bangladesh Water Partnership

Introduction

The Ganges-Brahmaputra-Meghna (GBM) river system is second only to the Amazon in drainage area and volume of discharge, but ranks first by far in every other respect. The three river systems have a drainage area of about 1.75 million sq.km, stretch across 16 states (in part or full) of India, Bangladesh, Nepal, Bhutan, and the Tibet Autonomous Region of China, which lies to the north of the eastern and central Himalaya, and are home to over 500 million people (Tables 1 and 2). About 10% of the world's people live in this region, in only 1.3% of the world's land area. The performance of the region, with respect to social indicators such as economic growth, education, and health, is disappointing in comparison to other regions of the world. The region contains the largest number of the world's poor (about 40% of the total number of poor in the developing world). Nearly half of the regional population lives below the poverty line, with a per capita income of less than US\$400 per year and a daily calorie intake of less than 2100. Moreover, the region faces common problems of over population, poverty, floods, droughts, and ecological imbalance. The population of the region is increasing steadily and, unless the current development trends are broken, poverty will become even more pervasive. Despite the poor socioeconomic status of the region, it is endowed with considerable natural resources that could be used to foster sustainable economic development. Water could be used as the engine to promote this economic development. Nepal has enough water for irrigation and hydropower. India needs a huge amount of water for irrigation. Bangladesh suffers heavily due to floods but also suffers from serious water stress during dry months. Water is essential for the sustenance of the people living in the GBM basin. However, it is regrettable that the optimal development and management of this vast natural resource for national and regional benefit has been obscured by political boundaries, differences in perception, and a legacy of mistrust. The countries in the region have had little experience of regional cooperation, although some progress has been achieved in a few areas of bilateralism.

Table 1: Drainage area of GBM region

Country	Ganges		Brahmaputra		Meghna		Total	
	sq.km	%	sq.km	%	sq.km	%	sq.km	%
Bangladesh	46,000	4	47,000	8	36,000	42	129,000	7
Bhutan	0		45,000 ^a	8	0		45,000 ^a	3
China	33,000	3	293,000	50	0		326,000	19
India	861,000	80	195,000	34	49,000	58	1,105,000	63
Nepal	140,000 ^b	13	0		0		140,000 ^b	8
Total	1,080,000	100	580,000	100	85,000	100	1,745,000^c	100
% of total	62		35		8		100	

Editor's note : some of these figures have been revised since this paper was presented to ^a38,500; ^b147,000; ^c1,746,000.
Source: ICIMOD/WMO Draft Full Project Document for 'The Hindu Kush -Himalayan Hydrological Cycle Observing System (HKH-HYCOS), November 2005

Table 2: Basin parameters in the GBM region

Country/Basin Parameters	Bangladesh	Bhutan	China	India	Nepal	GBM Total
Drainage area ('000 sq.km)	129	45 ^a	326	1105	140 ^b	1745 ^c
Arable area ('000 sq.km)	91	2	negligible	672	26	79.1
Population (millions)	123	0.7	3	408	22	557

Editor's note : some of these figures have been revised since this paper was presented to ^a38.5; ^b147; ^c1746. Source: ICIMOD/WMO Draft Full Project Document for 'The Hindu Kush -Himalayan Hydrological Cycle Observing System (HKH -HYCOS), November 2005

The world's water demands have increased steadily with increases in population and subsequent increases in various types of human activity. There is no doubt that this demand will further increase in the future with increases in population and higher living standards. Even when the world's population stabilises, the demand for certain resources, like water, will continue to increase because of higher per capita demands due to changing lifestyles both in developed and developing countries. The availability of an adequate quantity of water of an appropriate quality, for various human uses, is likely to be an increasingly important political and social issue in the coming decades, especially in developing countries. Similarly, the reliable availability of an adequate quantity and quality of water for increasing agricultural and industrial production and power generation will continue to be an important factor in this century. Water contamination is another important issue. At the same time, although water is gradually becoming a scarce resource globally, and its preservation and proper utilisation have become more and more important, its abundance in limited space and time has also become destructive in this part of South Asia. All these issues, as well as other factors, indicate that sustainable water management will be a challenge in the coming decades. Regional cooperation in the GBM is therefore very important for integrated water resource management in the basin. The people of the region have a great potential to improve their economic and social conditions by utilising the region's vast water resources (Table 3). However, despite some obvious developments, the GBM's abundant human and natural potential has not been creatively and cooperatively

harnessed. Development in the GBM basin must be people oriented and ensure regional equity and social justice for all sections of society. The GBM region has the potential to establish natural inter-country linkages and serve as a critical focus for regional development. This paper focuses on issues relating to water and its potential as a resource in the region; highlights constraints for its development; and emphasises the necessity for regional cooperation between India, Nepal, Bangladesh, Bhutan, and possibly China, in water resource management for flood mitigation, food production, environmental protection, and power development in the GBM basin (Figures 1 and 2).

Table 3: Socioeconomic indicators of the GBM region

	India	Bangladesh	Nepal	Bhutan
Population in millions (1998)	987	128	24	1.7
Annual population growth rate 1995 -2000 (%)	1.8	2.2	2.5	2.4
Infant mortality rate 1997 (per 1000)	71	81	75	87
Life expectancy at birth 1997 (yrs)	62	58	57	53
Under 5 mortality rate 1997	108	109	104	121
Access to safe water 1995	809 million 81%	103 million 79%	13 million 48%	1 million 58%
Access to sanitation	322 million 29%	37 million 45%	6 million 20%	1.19 million 70%
Adult literacy rate	696 million 52%	83 million 48%	15 million 28%	1.1 million 42%
Arable land (ha/capita)	0.17	0.07	0.13	NA
Per capita energy use 1996 (kg oil equivalent),	476	197	320	NA
Per capita electricity consumption 1996	459 kWh	103 kWh	56 kWh	144 kWh
Population below national poverty line (%)	53	48	53	NA
Per capita GNP 1998 (US\$)	430	350	210	430
Real per capita GDP 1997 (US\$)	1422	1382	1145	1382
Human Development Index 1995	0.451	0.371	0.351	0.347
Gender Development Index	0.424	0.342	0.327	0.330
NA = not available; GDP = gross domestic product; GNP = gross national product				

Water resources of the GBM region

There are no published detailed hydrological data available on the GBM region. However, a general picture of the water resource potential of the region is available. The three rivers constitute an interconnected system with an annual discharge of 1350 billion cubic metres of water and a replenishable groundwater resource of 230 billion cubic metres (Tables 4 and 5). The annual average water availability in the GBM region is 771,400 cubic metres per square kilometre. This is nearly three times the world average of 269,000 cubic metres per square kilometre. While India and Bangladesh share all three river systems, Nepal shares only the Ganges, and Bhutan and China only the Brahmaputra. The Ganges accounts for about 500 billion cubic metres, the Brahmaputra about 700 billion cubic metres, and the Meghna 150 billion cubic metres.



Figure 1: Catchment area of the Ganges, Brahmaputra, Meghna (GBM) river basin

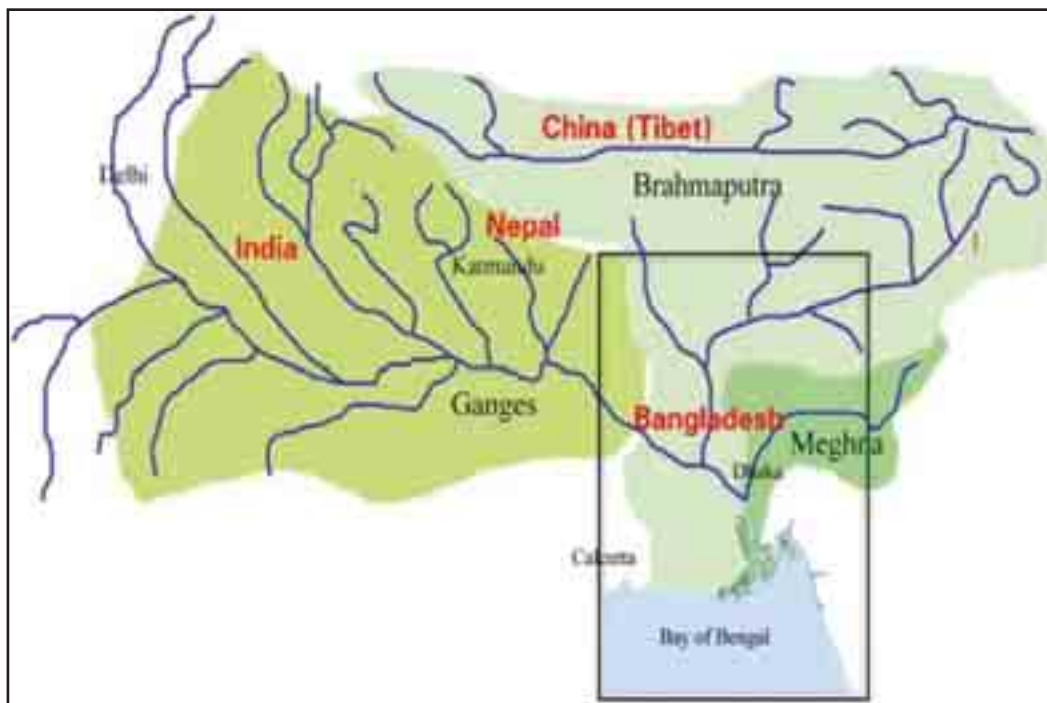


Figure 2: Catchments of the Ganges, Brahmaputra, and Meghna rivers

Table 4: Annual flow of the GBM rivers (billion m ³)			
Ganges	Brahmaputra	Meghna	Total GBM
500	700	150	1350

Table 5: Groundwater potential of the GBM basin (billion m ³)			
India	Nepal	Bangladesh	Total GBM
197	13	22	232

Major water resource issues in the region

Floods and droughts

The GBM countries are severely handicapped by recurrent floods, which cause damage to life, property, and infrastructure. The general flooding pattern is similar in all three countries, characterised by about 80% of annual rainfall occurring in a four to five month monsoon and often concentrated in heavy spells lasting several days. Bangladesh, being the lowest riparian country, bears the brunt of flooding in the GBM region. The monsoon water flow in Bangladesh is about 1060 billion cubic metres. Each year about 22% of the country is flooded and nearly 60% of Bangladesh's land area is considered flood prone. Flooding in Bangladesh is caused by a combination of factors including flash floods from neighbouring hills, inflow of water from upstream catchments, over bank spilling of rivers from in-country rainfall, and drainage congestion. Conditions become disastrous when flood peaks in all three rivers synchronise. The Ganges in northern India, which receives water from northern tributaries originating in the Himalayas, has a high flood damage potential, especially in Uttar Pradesh and Bihar. Likewise, the Brahmaputra and the Barak (headwaters of the Meghna) drain regions of very heavy rainfall and produce floods from over bank spilling and drainage congestion in north-eastern India (Figures 3 and 4).

There is marked seasonal variability of water volume in the GBM river systems, and the dry season flow, particularly in the Ganges, is inadequate to meet the combined needs of the region. The reduced flow of the Ganges in the dry season has exacerbated the northward movement of the salinity front, thereby threatening the environmental health of the region. The dry season flow (from November to April) in Bangladesh, from the cross border rivers, amounts to only 159 billion cu.m. In the critical dry month of March, when the water need is at its peak, the river flows reduce to a mere total of 18 billion cu.m. Due to frequent droughts and periods of water scarcity, natural water bodies like ponds, beels, rivers, and rivulets dry up. The groundwater table drops to alarming levels and beyond the suction limit. Drying up of sources puts serious stress on the supply of water for drinking, domestic, municipal, industrial, and agricultural uses.

River-bank erosion

Large seasonal variations in river flows and the gradual loss of channel depth cause banks to erode and river courses to change. Wave action during the high water stage further accelerates this process. River erosion manifests in channel shifting, the creation of new channels during floods, bank slumping due to undercutting, and local scour from turbulence caused by obstruction. River-bank erosion is responsible for the destruction of fertile agricultural land, homesteads, and sometimes entire clusters of villages. Harnessing the bounty of the GBM rivers requires that monsoon flows be stored and redistributed over space and time, when and where required, within a framework of sustainable development.



Figure 3: Loss, damage, and suffering of people due to flooding



Figure 4: Simulated maximum flood depths in 1988

Satellite images of the GBM rivers show that in the ten years between 1982 and 1992 more than 106,300 ha of land was lost and only 19,300 ha was formed as a result of river erosion. The net loss of 87,000 ha over the period is equivalent to an annual loss of 8700 ha, most of it agricultural land. Studies show that, of a population of 1.88 million who make their home in the Brahmaputra flood plain, about 450,000 live within the river-bank. Between 1982 and 1992, about 350,000 people were displaced because 45,000 lost their land due to erosion (Figures 5a and b).

Sedimentation

The GBM rivers convey an enormous amount of sediment load from the mountains to the plains. This compounds the adverse effects of floods. The Kosi and the Brahmaputra are particularly notable in this respect. Bangladesh is the outlet for all of the major rivers and the average annual sediment load that passes through the country to the Bay of Bengal varies from 0.5 billion to 1.8 billion tonnes. Part of this sediment load is deposited on the floodplain during over bank spilling. This process gradually changes the valley geometry and floodplain topography, often reducing the water conveyance capacity and navigability of drainage channels (Figure 6).

Water quality deterioration

Water quality in the region has progressively deteriorated due to increased withdrawals for various uses leaving insufficient flows to dilute pollutants during lean periods. The increased use of agrochemicals and the discharge of untreated domestic sewage and industrial effluents into rivers have aggravated this problem. Pollution of the entire water resource system has now reached alarming proportions (Figure 7). An additional problem in Bangladesh is the high concentration of arsenic in groundwater.

In Nepal, water quality has deteriorated mainly due to industrial pollution. Although the volume of effluent generated by most industry is not large, the concentration of pollutants is remarkably high. In the late 1980s, India undertook an elaborate water quality-monitoring programme under the 'Ganga Action Plan'. This was recently incorporated into a larger National Rivers Conservation Programme. In Bangladesh, the magnitude of water quality deterioration is further compounded by salinity intrusion in the south-western region (Figure 8). The reduced flow of the Ganges in the dry season has exacerbated the northward movement of the salinity front, thereby threatening the environmental health of the region. Since the late 1970s, the south-western region of Bangladesh has been facing the critical problem of salinity intrusion from the Bay of Bengal. This is a result of the drastic reduction in fresh water flows in the Goari River – the major distributary of the Ganges. The intensity of salinity in the Khulna region at times rose to 26,000 micro-mhos from the pre-Farakka normal range of only 500 micro-mhos. Moreover, the reduction in dry season flows of the Ganges, the Teesta, and other rivers is giving rise to increased pollution in rivers. The salinity problem in the southwest region during the late 1980s and early 1990s assumed such proportions that it triggered eco-migration from that region and the biodiversity in the Sundarbans (the largest mangrove forest in the world) underwent severe degradation.



Figure 5(a): Bank erosion



Figure 5(b): Satellite images show that 1000 ha of land are lost every year due to river bank erosion of the Meghna



Figure 6: Sedimentation in the river basin



Figure 7: Water quality deterioration and its impacts

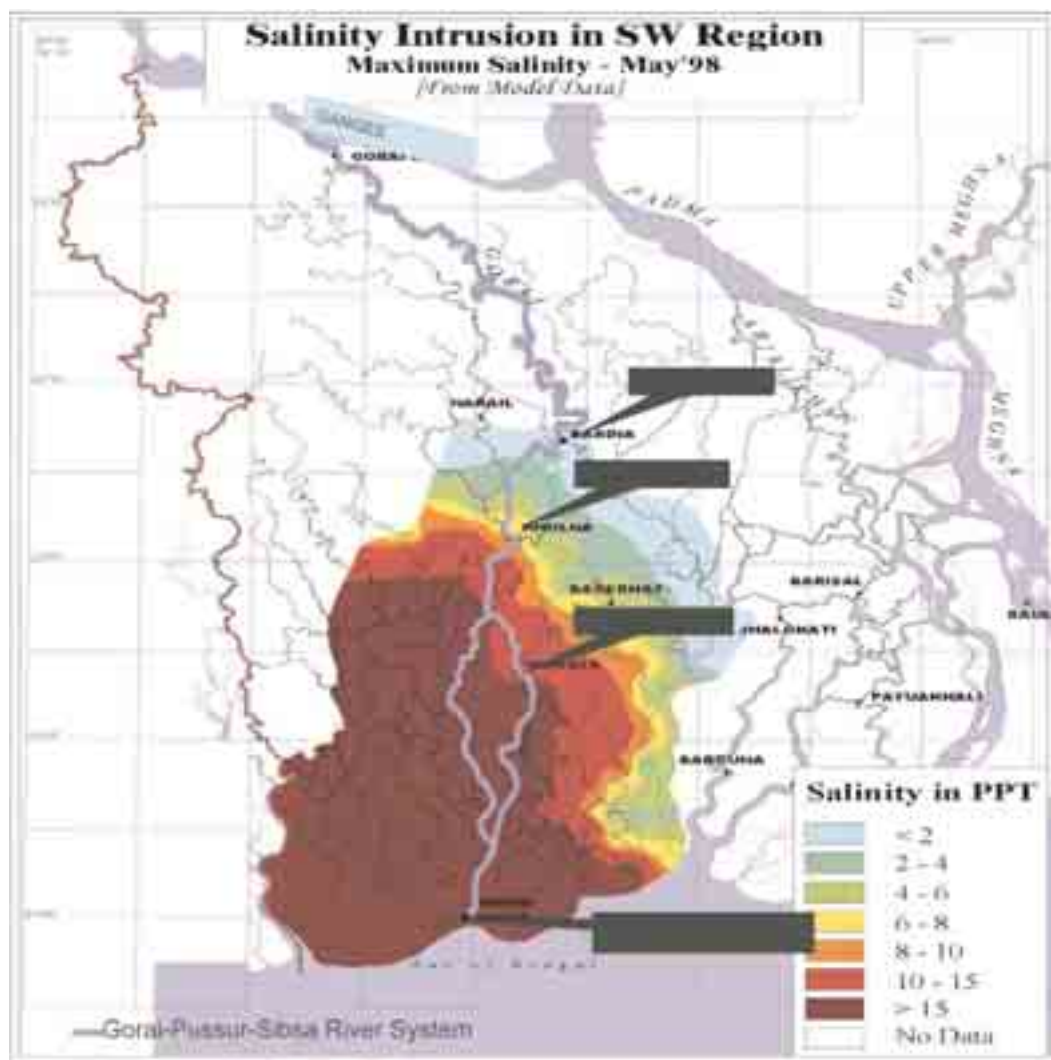


Figure 8: Salinity intrusion in Bangladesh

Climate change

The impact of climate change in the GBM region could be very significant. General circulation models have revealed that mean annual rainfall in the north-eastern part of the South Asian subcontinent could increase with higher temperatures. The 'best estimate' scenario for 2030 is that monsoon rainfall could increase by 10-15%. It is believed that increased evaporation, resulting from higher temperatures in combination with regional changes in precipitation characteristics (e.g., total amount, spatial and seasonal variability, and frequency of extremes), has the potential to affect mean runoff, the frequency and intensity of floods and drought, soil moisture, and surface and groundwater availability in GBM countries. It could also increase the rate of snowmelt in the Himalayas and reduce the amount of snowfall, if winters become shorter. If climate change alters the rainfall pattern in the Himalayas, the impact would be felt in downstream countries like India (northern part) and Bangladesh. Any change

in the length of the monsoon would also be significant. If the monsoon period becomes shorter, soil moisture deficits in some areas might get worse. On the other hand, prolonged monsoons might cause frequent flooding and increase inundation depths. By and large, any change in the availability of water resources as a consequence of climate change could have a substantial effect on agriculture, fisheries, navigation, industrial and domestic water supply, salinity control, and reservoir storage and operation. In addition, the anticipated sea level rise in the Bay of Bengal would further compound the problem in Bangladesh, through coastal submergence and enhanced drainage congestion on the flood plain.

Demand management

Sustainable water management requires a comprehensive, cost effective, market oriented, and participatory approach to demand management. Nepal has formulated liberal policies to strengthen its economy and made corresponding changes to the role of the state and the market in its water resources policy. The National Water Policy adopted in India in 1987, defined the priority given to different water using sectors. It treated water as an economic good and proposed the use of water pricing in a manner that would cover the cost of investment, operation, and maintenance. The National Water Policy approved in January 1999, emphasised the accessibility of water by all, and proposed to develop a sustainable public and private water delivery system, including the delineation of water rights and guidelines for water pricing. Demand management requires certain prerequisites, like an efficient water distribution system, the full dissemination of the demand and supply situation, and a regulatory framework – conditions that are lacking at present in GBM countries. It may also require a system of administered control, which determines water allocation and pricing according to given or chosen social, economic, and environmental criteria. This is partially in operation in the region.

Gender dimension

Women play a vital role as water collectors and water managers. They are the principal managers of domestic water needs and family health care. It is women who possess the knowledge of the location, dependability, and quality of local water resources. Their indigenous knowledge of local water conditions is passed on to successive generations. Collecting water for the family is an arduous and tiring task, especially in hilly and semi-arid regions. Not only adult women but also girls are involved in this life of hard labour and drudgery. Despite the fact that women have such a responsibility in relation to water, they enjoy little or no authority in decision making for water management. Their knowledge and perceptions could be gainfully used to plan water distribution networks, design and locate water pumps, and organise the community management of water use facilities. The ultimate goal concerning the gender dimension of water management is to attain and ensure equal access for both genders in its allocation and use.

Institution and governance

The institutions in the region that are responsible for implementing water policies and strategies suffer from serious flaws. They lack efficiency, or perform sub-optimally, in

such components as a comprehensive legal and regulatory framework, implementing rules, and designing appropriate organisations that are not only accountable, but also responsive, to user needs. Water sector planning, however, is now changing from a top-down technocratic approach, to a bottom-up grassroots approach. The goal is to attain a genuinely participatory water management environment. This is the only way to enhance the quality of governance in the region. Along with the participatory approach, come the steps to develop a nexus between the public and private sectors in relation to water development and management. Public sector water institutions have a poor record of cost recovery. The involvement of the private sector in build-own-operate models is expected to lessen public sector deficiencies, improve the level of governance, and attract and generate infrastructure investments.

Water resources development potential in the GBM region

The GBM region has tremendous agro-climatic diversity; a large fertile and arable land area of about 79 million hectares; a 2.6 billion tonne silt load; an enormous delta with its apex just below Farakka in India; some 110,000 MW of identified hydropower potential with additional power available through pump storage capacity; a vast navigable waterway; varied forest resources including the largest mangrove forest in the world; a treasure-house of biodiversity; and abundant fish resources. Water is the single most important natural resource in GBM countries and can contribute to shaping the future of millions of people living in the region.

Seasonal variation in water availability (abundant water during the monsoon and little water during the dry season) means that harnessing of the bounty of this water is essential. This requires storage and redistribution of monsoon flows, over space and time, when and where required, within a framework of sustainable development.

Integrated water resources management is the most promising method for utilising the vast potential of water resources, thereby achieving social and economic transformation in northern and north-eastern India, Bangladesh, Bhutan and Nepal.

Flood management

The rivers of the GBM systems rise in the Himalayas, and after traversing the plains of India and Bangladesh, join the sea. Bangladesh, being the terminus of all three major river systems, acts as a funnel for the enormous runoff generated mostly outside its boundaries and faces the brunt of the fury of the floods. The entire GBM region has experienced floods since ancient times. The poor segments of the population who occupy the low-lying vulnerable zones constitute the bulk of the sufferers. Flood management in the GBM region therefore demands an integrated approach involving cooperation among all co-basin countries.

Both India and Bangladesh have undertaken some in-country measures towards flood mitigation during the past four decades. These include the building of embankments, river training, and channel and drainage improvement. Upstream storage reservoirs can play a vital role in flood management. The construction of upstream storage reservoirs

(outside Bangladesh) is technically and economically feasible provided there is a suitable reservoir regulation arrangement. Such storage reservoirs may not be economically justifiable for flood moderation purposes only. They must be multipurpose reservoirs and provide additional benefits such as hydropower, irrigation, and dry season flow augmentation. Potential reservoir sites do exist in the GBM region and their exploration and use should form part of the long-term vision for flood management, especially in Assam (India), northern India, and Bangladesh.

Among the non-structural flood management approaches, the greatest potential for regional cooperation lies in flood forecasting and warning. Bilateral cooperation currently exists between Nepal and India and between India and Bangladesh for the transmission of flood related data. This cooperation needs to be further strengthened. More reliable forecasts and additional lead time are needed. This would be possible if more frequent real time and daily forecast level transmissions could be sent from additional upstream points on the three rivers. Such effective flood data sharing arrangements are also necessary with the upper riparian countries, Nepal and Bhutan, to provide Bangladesh with greater lead time to undertake disaster preparedness measures. An increase in lead time to make forecasting more reliable can be achieved by implementing the following arrangements:

- three-hourly real time and daily forecast level data transmission between May and October, irrespective of warning stage;
- real time and forecast data transmission from further upstream stations such as Monghyr, Patna, and Allahabad on the Ganges; Guwahati, Tejpur, and Dibrugarh on the Brahmaputra; and Teesta Bazar, Gajaldoba, and Jalpaiguri on the Teesta; and
- joint calibration of hydrodynamic simulation models by Bangladesh and India to increase the accuracy of lead time and forecasts.

These arrangements were part of the suggestions made in the flood studies undertaken by Bangladesh bilaterally with India, Nepal, and Bhutan between 1988 and 1990.

A review of the current status of flood forecasting methods in Bangladesh and India found that both countries are using similar technologies for data observation and transmission. Both countries use similar methods to process data concerning flood forecasts, mostly based upon the statistical correlation between base stations and forecasting stations. Automatic water level recorders have been installed at a number of sites in the Ganges Basin, both in Bangladesh and India. Many of the hydrological stations in both countries have facilities for the observation of other parameters such as rainfall, humidity, and temperature that are usually taken into consideration in mathematical models for flood forecasting.

A further improvement in model development for effective flood forecasting in Bangladesh would be possible if a data exchange arrangement with India is made in relation to the following:

- river cross-section data on upstream stretches of the Ganges, the Brahmaputra, the Meghna/Barak, and the Teesta;
- three-hourly water levels and daily forecasts for several upstream stations on the four above mentioned rivers;
- daily discharge data at these stations and the outfalls of the Kosi, Gandak, and Ghagra;
- daily rainfall data from several upstream stations in the Ganges, the Brahmaputra, the Meghna/Barak, and the Teesta; and
- water level discharge and rainfall data from representative stations along medium and flashy rivers in the northwest, north, and east of the country.

Such exhaustive data sharing with India, Nepal, and Bhutan would enable Bangladesh to develop a dynamic river routing model for its river systems and generate a state-of-the-art flood forecast model that would benefit the flood prone population of the GBM region.

Dry season flow augmentation and sharing of common rivers

The seasonal variability of water volume in the GBM river systems means that the dry season flow of the GBM rivers, particularly of the Ganges, is inadequate to meet the combined needs of the region. As early as 1974, the Prime Ministers of India and Bangladesh recognised the need to augment the dry season Ganges flow. The Ganges Water Sharing Treaty of 1996 includes a provision for the two governments: "to cooperate with each other in finding a solution to the long-term problem of augmenting the flows of the Ganges during the dry season". With West Bengal (India) also seeking additional water to meet its requirements, the issue of augmentation deserves serious attention. The Calcutta Port Authority is concerned that the Ganges treaty has diminished lean season diversions into the Bhagirathi, which affects drafts, requiring increased dredging.

One possible augmentation option for the Ganges, which could benefit Bangladesh, India, and Nepal, would be to construct large storage reservoirs on the Ganges tributaries originating in Nepal. A highly favourable project from this perspective is the Sapta Koshi High Dam in Nepal, the revived third phase of the original Koshi project. The Koshi Dam will have a significant storage capacity, that should be able to provide both North Bihar (India) and Bangladesh with a flood cushion and augment dry season flows, after meeting Nepal's full irrigation requirements.

Another augmentation option could be the proposed Sunkosh dam in Bhutan with a power potential of 4000 MW. It is proposed that water stored behind the dam could be released into a canal, designed to provide a two-stage link to the Teesta and Mahananda barrages in West Bengal. Augmentation of about 12,000 cusec (340 cumec) is expected, part of which could supplement the water needs of the two Teesta barrages (one in west Bengal and the other in Bangladesh) and part of which could reach the Ganges at Farakka. This option is awaiting a full environmental assessment and Bhutan's concurrence.

Storage reservoirs in the Himalayas would have to be multipurpose in order to be economically justifiable. The issues of population displacement and seismic hazards have often been raised against schemes for large reservoirs in the Himalayas. Needless to say, these socio-environmental issues are also very important and cannot be ignored.

The issue of augmentation has a direct relationship with concerns about transboundary water sharing among the co-riparian countries. The Ganges Treaty of 1996 calls on India and Bangladesh to make efforts to conclude water-sharing agreements with regard to other common rivers. One river that has received priority in water-sharing negotiations is the Teesta, especially as lean season flows are inadequate to meet the requirements of both countries and each country has constructed a barrage on the river. Although some ad hoc sharing ratios were proposed earlier, it may be useful to examine seriously the option of Teesta augmentation as well as the possibility of an arrangement to operate the two barrages in tandem. If so, the parts of Bangladesh lying outside its barrage command area, could be irrigated by extending canals from the barrage in India.

Along the same track of regional cooperation, various other arrangements for augmentation and sharing could be conceived against a backdrop of probable trade-offs between the two countries. One such possibility is a westward diversion link (though Indian territory) between the Brahmaputra and the Ganges, with provision for diversion along a lower alignment to augment Teesta waters in Bangladesh. Alternatively, there could be a further alignment southward to revive derelict streams and linkup with the Ganges above the proposed barrage site at Pangsha. Some of these options are futuristic in content, yet they deserve consideration within a long-term timeframe for the region.

Linked to the issues of water sharing, lean season water availability, and augmentation options is the state of the rivers' ecological health. The environment is now recognised as a stakeholder in the water demand nexus. Hence, apart from meeting the requirements of irrigation, power generation, domestic supply, and other consumptive uses, a reasonable quantity of water must be available in the rivers to sustain channel equilibrium and maintain acceptable water quality standards. The question of setting aside a proportion of water in the river received attention in the past Indo-Bangladesh negotiations about the sharing of the Brahmaputra and Teesta waters. All future planning for water resource development will need to take special note of this aspect.

Following the Ganges Treaty of 1996, Bangladesh has the opportunity to plan for the environmental regeneration of its south-eastern hydrological system. One option is to construct a Ganges barrage at Pangsha to pond the river and force it backwards into the Gorai (the principal distributary of the Ganges in Bangladesh). India has offered to assist in a feasibility study for such a venture and extend whatever technical support it can. However, several international funding agencies have expressed reservations about such an intervention. These agencies have stressed that resuscitation of the Gorai, through dredging to help the rejuvenation of a network of moribund channels, ox-bow

lakes, and other wetlands in the southwest, could be sufficient. Work on the Gorai restoration and associated studies are now in progress. An options study to establish the best utilisation of the water available as a result of the Ganges Treaty, including a barrage on the Ganges, has just been initiated. Despite dredging, the Gorai's siltation proneness at its intake point from the Ganges necessitates additional measures, like the Ganges barrage, to supplement the flows and achieve long-term environmental sustainability.

Hydropower development

Nepal is the lead country in the GBM region in terms of hydropower potential. The abundant rain-fed and snow-fed water resources and topography with favourable relief provide an excellent setting in Nepal for ample economic electricity. These resources are spread over the Koshi, Gandak, Karnali, and Mahakali river systems in the Ganges Basin. Nepal has a theoretical potential of about 83,000 MW and an economic potential of about 40,000 MW. In India, the GBM region has an identified potential of over 45,000 MW. Bangladesh has a theoretical hydropower potential of about 52,000 GWh but it does not have the topographic conditions favourable for hydroelectricity generation. The country's lone hydroelectric plant in the south-eastern hills has an installed capacity of only 230 MW. Bhutan has a theoretical hydro potential of 21,000 MW, and commercially feasible potential of 4000 MW. Pakistan has an estimated hydro potential of 20,777 MW and a potential installed capacity of about 15,000 MW.

Nepal, the uppermost co-riparian country in the Ganges Basin, contributes as much as 41% of the total run-off and 71% of the lean flows. Most (80%) of the flows occur during the four months of the monsoon. For the remaining eight months, the flow is low and inadequate for existing human needs. Uncontrolled monsoon flows result in flooding over large areas extending into the territories of other co-riparian countries, such as India and Bangladesh, causing loss of life, damage to crops and property, the contamination of water supplies, the spread of water borne diseases, and general disruption of economic activities.

To derive the full benefit and multipurpose utility from Ganga water, storage dams need to be built. This would not only control flooding, but also yield substantial benefits in terms of hydroelectricity and irrigation facilities. Monsoon storage can also augment dry season flow, improve navigation, and help maintain the ecological balance of the region as a whole. To achieve such multiple benefits, it is logical to start with the development of water resources in Nepal, located in the upper reaches of the Ganges in the GBM river system. Nepal has identified a large number of sites/schemes, some of which could regulate 40% of the monsoon flows. Recently identified feasible schemes could not only produce up to 20,000 MW of electric power, provide irrigation facilities for thousands and thousands of hectares of agricultural land, and mitigate floods to protect from human misery, but also increase by two-fold the lean flows of the Ganges River thus benefiting both India and Bangladesh.

The economic justification for reservoirs in the Himalayas for flood moderation and flow augmentation is increased manifold when these reservoirs also produce electricity for

the region. Such projects not only cater to the needs of Nepal or Bhutan, but to the vast and growing energy market in northern India and Bangladesh. GBM countries could share the costs and benefits of such multipurpose reservoir projects on agreed terms. It is necessary to visualise and plan for the establishment of an inter-country energy grid stretching across the GBM countries. This interconnected grid would facilitate the integration of different power systems across the region and allow Nepal and Bhutan to export excess hydropower to India and Bangladesh.

Among India's five regions, in power grid terms, the northern and eastern regions, which contain India's two largest and most populous states (Uttar Pradesh and Bihar) would be the real beneficiaries of Nepal's hydroelectric potential. These two regions together account for around 45% of the country's total power generation. It is estimated that peak demands in the northern and eastern regions are likely to be 48,600 and 21,300 MW, respectively, in 2007, and 58,000 and 22,900 MW in 2010. The additional hydro generation required in 2010 would be 15,000 and 7000 MW to maintain the intended mix in these regions. Considering that the sites for hydro schemes in the northern region are mostly located in high rugged hills, requiring costly facilities for evacuation to distant areas of demand concentration, and the almost non-availability of hydro potential in the eastern region, Nepal's hydro schemes could definitely play a supportive and complementary role to the mutual interest and benefit of both countries.

Water quality

Deterioration in both surface and groundwater quality is now a matter of serious concern in the GBM region. Water is essential to sustain agricultural growth and productivity. It is even more vital for life and healthy living. More than half of the morbidity in the GBM region stems from the use of impure drinking water. Safe water supply and hygienic sanitation are basic minimum needs that GBM countries have yet to meet in both rural and urban areas.

Due to the geographic location of Bangladesh as the downstream riparian state of three catchments (the Ganges, Brahmaputra, and Meghna), there are specific cross-border issues in relation to water quality. The quality parameters that are of concern for Bangladesh, as well as for the entire region, include sediment load, industrial effluents, agrochemicals, and domestic waste. The amount of sediment in the Brahmaputra has increased in recent years with indications that the constituent material is getting coarser, with a higher percentage of sand, and lower content of organic matter. The probable causes are environmental damage in the upper catchments in China and India, where the removal of vegetative cover has intensified gully erosion. Similar processes may also be active in the Nepal Himalayas, triggering sediment load generation in the Ganges system. This problem can be addressed through regional initiatives under an appropriate institutional structure for integrated catchment planning and management. A holistic approach is required to monitor the water quality in each country, together with regional initiatives to both prevent further deterioration and bring about improvement in the quality of water.

Pollution from industrial effluents, agrochemicals, and domestic waste is diluted in the monsoon, but often rises to alarming proportions in the low flow season, especially near densely populated zones. Industries engaged in using and producing chemicals, paper/pulp, sugar, dyes, and various metals, and large urban centres near rivers discharging untreated waste into them, are often responsible for cross-border water quality problems by virtue of their location. A regional approach to meeting the challenges through awareness building, data exchange, and mutual assistance in pollution control will enhance the prospects for maintaining water quality in cross-border streams.

Additional problems in Bangladesh are salinity and arsenic contamination of groundwater. Low flow in the dry season in the southwest has increased the extent of saline intrusion inland. This requires monitoring as well as long-term measures to store monsoon water, resuscitate channels, and enhance dry season flushing. Careful monitoring against the over extraction of groundwater in coastal areas is also required as a precautionary step to prevent saline intrusion. High levels of arsenic in groundwater (over the permissible level of 0.05 mg/l) have been detected in 61 of the 64 districts in Bangladesh, especially in the south-western, south-central, and south-eastern regions. This has serious implications for domestic water supply as well as for the agricultural sector because of the transfer of arsenic into the food chain through irrigated crops. It is therefore necessary to review the dependence on groundwater for the supply of safe water. The alternative is to revert to surface water for domestic consumption – an alarming spectre in the context of health and morbidity. The Government has launched a four year, 44.4 million dollar, Bangladesh Arsenic Mitigation Water Supply Project funded by the World Bank and the Swiss Agency for Development and Cooperation with a view to providing an arsenic free water supply to rural and urban communities. The project will assist the government in (a) identifying the causes of arsenic contamination, (b) determining alternate sources of water supply, (c) awareness building on arsenic hazards, and (d) preparing a detailed proposal for a national programme for arsenic mitigation.

Countries should review their existing water quality and water pollution laws and make efforts to enforce the 'polluter pays' principle. At the regional level, several measures are needed over the medium and long-term to control water quality. These should include (a) standardisation of water quality parameters for different users, (b) coordination of water quality monitoring at cross border sites, and (c) a mechanism for data/information exchange on pollution status.

Inland navigation

The Ganges, the Brahmaputra, and the Meghna/Barak have served as major arteries for trade and commerce for centuries. In recent years, their importance has diminished as traffic has moved from the water to the alternative modes of road and rail. However, the lower part of the GBM basin is still dependent on waterways, especially in Bangladesh. GBM countries can look forward to the rejuvenation of this natural asset under an integrated and coordinated scheme for the development of inland navigation throughout the region.

As a landlocked country, Nepal has a vital interest in securing access to the sea through rivers. The establishment of links with the inland water transport networks of India and Bangladesh would provide Nepal with access to the ports of Kolkata (India) and Mongla (Bangladesh). Potential exists for the development of water transport in Nepal in all three major rivers (the Karnali, Gandaki, and Koshi) that are tributaries of the Ganges. The concentration of high dam schemes on these rivers would improve the navigability of these channels. The Karnali has the maximum potential for navigation – all the way from the Indo-Nepalese border to the confluence with the Ganges.

The Gandaki is an important waterway serving central Nepal, and has navigation potential for eastern Uttar Pradesh and eastern Bihar in India, by linking with India's National Waterway No.1 in the Ganges running from Allahabad to Haldia, below Kolkata. The upper reaches of the Kosi River are too steep for navigation, but river training works could facilitate the operation of shallow draft barges. Among the multiple benefits to be derived from the proposed Sapta Kosi High Dam, is the provision of a navigational channel with a dedicated storage. The principal focus for Nepal's navigation development would be to gain exit to the sea through the Ganges, and obtain linkages with the inland ports in India en route. The strategy should be to ensure that structures constructed in water development projects do not impede the development of inland water routes.

With a view to reviving the past significance of inland water routes, India has already designated the Ganges between Allahabad and Haldia (1629 km) as the National Waterway No.1 and the Brahmaputra between Sadiya and Dhubri (891 km) as the National Waterway No 2. The maintenance and further development of navigable depth, navigational aids, and terminal facilities would enhance navigation potential in the GBM region. India and Bangladesh have a bilateral protocol, renewed every two years, for using the Ganges-Brahmaputra-Meghna river for water transit between West Bengal and Assam. These routes – not optimally used at present – could improve their potential through channel improvement, better pilotage and navigation aids, and standardisation of rules and regulations. A dedicated willingness to integrate the waterways network in the GBM region would benefit all GBM countries in the long run.

Catchment management

The geographically interlinked character of the major rivers in the GBM region warrants an integrated regional approach to the care and management of the catchment. Sound basin wide catchment management is an essential long-term strategy to combat the threat of floods and preserve the ecosystem. The sediment load in rivers, which is largely the consequence of geomorphologic processes in the upper catchments, tends to increase with the progressive removal of vegetative cover on slopes. Soil conservation and reforestation in the upper catchments of Nepal and India, as well as within Bangladesh, could help in substantially reducing sedimentation. In most water resources development programmes at higher elevations, soil conservation practices are initiated as a follow-up step. This should not be so. Soil conservation and management could be undertaken independently at vulnerable sites, as well as through

integrating them in the environmental management plans for water related interventions. Soil conservation strategies should be both rehabilitative and preventative and can only succeed with people's participation. Considering the fragility of the Himalayan ecosystem and the burgeoning population pressure on hill slopes, an integral part of water resource planning should be to adopt rational land use and cropping patterns, including contour ploughing, in the upper catchments. Measures to conserve soil quality and improve the ecological health of the land might be highly desirable in the context of area development programmes in upland regions, which tend to be neglected or are less accessible.

Potential areas for regional cooperation in the GBM region

The potential areas for cooperation are as follows.

- Supply of water storage benefits: irrigation water and flood mitigation from Nepal to India, from Nepal to Bangladesh, from Bhutan to Bangladesh, from India to Bangladesh
- Granting of navigation, transit, and communication rights: India and Bangladesh to Nepal, Bangladesh to India
- Granting of secure expectations of minimum flow: India to Bangladesh, Nepal to India, Bhutan to India
- Supply of hydropower: from Nepal and Bhutan to India and Bangladesh
- Finance for the construction of facilities
- Engineering expertise for facilities
- Finance to ensure equity in the achievement and sequencing of benefits among countries

The exchanges which are either occurring, under discussion, or conceivable between the pairs of the governments are set out in Table 6.

The legal aspects of integrated river basin development

The Helsinki Rules on the Uses of the Waters of International Rivers, adopted by the International Law Association in 1966, provide that all basin states have the right to access to, and an equitable and reasonable share of, the water flow of an international river.

According to the United Nations laws on human environment regarding hydrological regions: "The net benefits of hydrological regions common to more than one national jurisdiction are to be shared equitably by the nations" (UN 1972).

At the Stockholm Conference on the Human Environment of 1972, one of the principles laid down was that: "Every state has the sovereign right to exploit their own resources pursuant to their own environmental policies and the responsibility to ensure that activities within their jurisdiction or control do not cause damage to the environment of other states or of areas beyond the limits of national jurisdiction" (UN 1972).

Table 6: Potential exchanges between governments in the GBM region

Potential Parties	Exchanges
Nepal to India	supply of hydropower supply of water storage benefits
India to Nepal	navigation and transit provision of finance for construction provision of engineering expertise
India to Bangladesh	supply of water storage benefits granting minimum flow
Bangladesh to India	granting navigation, transit, and communication rights
Nepal to Bangladesh	supply of hydropower supply of water storage benefits
Bhutan to India	supply of hydropower supply of water storage benefits
India to Bhutan	navigation and transit provision of finance for construction provision of engineering expertise
Bhutan to Bangladesh	supply of hydropower supply of water storage benefits
Bangladesh to Bhutan	navigation and transit provision of engineering expertise
International community to all four governments	provision of finance for feasibility and construction provision of expertise for projects provision of finance to ensure equity in the distribution of benefits

Reference must also be made to the Economic Declaration adopted by the Fourth Conference of the Heads of States or Governments of Non-Aligned Countries held at Algiers, 5-9 September 1973, which states that: "Environmental measures adopted by one state should not adversely affect the environment of other states or zones outside their jurisdiction" (UN 1973).

Some 200 river treaties, about half of them in Europe, have been negotiated by countries for the management of this shared resource. Bangladesh, Bhutan, China, India, and Nepal are co-basin states of the Ganges-Brahmaputra-Meghna River Basins. There is no reason why the water and land of these three basins cannot be developed on a cooperative basis to solve flooding and other problems in the region. The term 'integrated river basin development' is used here to imply the orderly marshalling of the water resources of river basins for multiple purposes to promote human welfare. This welfare is related to various development works in connection with all the reasonable possibilities of the basin. They may include irrigation and drainage, electric energy generation, navigation, flood control, watershed treatment, industrial and domestic uses of water, reservations, and wildlife conservation.

Roles of international organisations in the regional cooperation and management of international rivers

During the past decades, international organisations have played a very limited role in facilitating agreements for the management of international river basins. Unquestionably the most noteworthy and successful case was when the World Bank played a critical role as a catalyst to get co-basin countries India and Pakistan to agree to a treaty in relation to the Indus river basin. In recent years, two other international organisations have attempted to play a role in managing international rivers – UNEP in

relation to the Zambesi River, and UNDP in relation to the Mekong River. The first resulted in the 'International Agreement on the Action Plan for the Environmentally Sound Management of the Common Zambesi River System' covering eight countries (Angola, Botswana, Malawi, Mozambique, Namibia, Tanzania, Zambia, and Zimbabwe). The second, facilitated by UNDP, resulted in the signing of an agreement in 1995 by four lower co-basin countries on cooperation for the sustainable development of the Mekong River Basin. It is too early to make any judgment on the impact of this agreement. However, the fact remains that UNDP played: "the roles of godfather, referee, rich uncle, and fund raiser to the Mekong Committee", which has spent hundreds of millions of dollars but only produced meagre results. In recent decades, international organisations have played a very marginal role in resolving conflict in relation to international rivers and lakes. If there had been dynamic leadership in the major international institutions, they could have played a significantly more effective role in this area during the past three and a half decades.

International funding agencies have generally declined to provide loans for the development of international waters, until and unless the countries concerned signed a mutually acceptable agreement. Without external financial assistance, developing countries have often been unable to construct capital-intensive water development projects on international rivers, even if they had unilaterally wanted to. An analysis of the latest trends indicates that this situation is gradually changing.

- Many of the countries concerned are now capable of raising the necessary investment funds from internal national sources (e.g., China, India, Turkey) and thus are becoming increasingly more self sufficient.
- Private sector funds, both international and national, can now be harnessed for major water development projects (e.g., Turkey).
- International funding agencies appear to be taking a somewhat more flexible approach to supporting many aspects of development activities on international rivers. For example, while they are still continuing to decline finance for construction of main hydraulic structures like dams and hydropower plants, they have begun to support associated activities like irrigation, agricultural development, flood management, and water utility partnerships through global water partnerships, even though such projects use water from international rivers on which no agreement has been reached.
- In most cases, multilateral and bilateral financing supports only a limited part of the total project cost. Even this support has been declining steadily as a percentage of project cost during the past decade. The absence of international funds often means only an extension of the time needed for construction of the project; it may not necessarily stop the project.

Herein lies one of the principal challenges for the water profession in the 21st century: how to develop and manage various international water sources like the GBM, sustainably and efficiently, in full agreement and cooperation with concerned co-basin countries, so that the result is a 'win-win' situation for all parties concerned. To meet this challenge, water development should not be confined to techno-economic-

environmental factors alone, as is generally the case for exclusively national sources of water. Other factors also need to be considered such as bi-national or multinational politics; the relative power of the country in which the water development project would take place compared to other co-basin countries; the maintenance of good relations between co-basin countries; and the overall international and media interest in the proposed project (originating mostly as a result of environmental and social reasons). Current trends indicate that increasing water scarcity and the contribution of water development to regional economic redistribution are likely to exert tremendous domestic political pressure in many countries. This could result in countries taking purely national decisions to develop international water bodies, irrespective of the potential impact of such decisions on other co-basin countries. These and other similar associated issues are likely to significantly complicate water management processes in the future. Hydropolitics, both internal and external, is thus likely to become an increasingly important global issue in coming decades for the management of international river and lake basins and aquifers.

The Global Water Partnership is an international network established in 1996 that is now engaged in fostering integrated water resources management in various ways at all levels. This network can play an important role in integrated water resources management in the GBM region and create an enabling environment for regional cooperation in the GBM basin. The network includes water related organisations, developed and developing country government institutions, United Nations agencies, bi and multilateral development banks, professional associations, research institutions, non-government organisations, and the private sector. The Third South Asia Water Forum of the Global Water Partnership South Asia, held in Dhaka in July 2004, promulgated a Dhaka Declaration to form the Ganges River Basin Organization involving all riparian countries. This would be a two-track effort involving civil society, research institutions, and environmental organisations to forge regional cooperation. Similar efforts are also needed for the Brahmaputra basin involving all riparian countries including China. ICIMOD can play a facilitating role in the formation of such river basin organisations.

Constraints to integrated water resources management in the GBM Basin and on regional cooperation

Maximising the potential of water resources in the GBM region can only be achieved by creating an enabling environment in the region. The flourishing of such an environment is currently hindered by various constraints. The first and foremost constraint is the existing mindset in the region. This mindset is characterised not only by a certain absence of goodwill but also by a lack of mutual confidence, mistrust, suspicion of motives, differences in perception, and lack of an egalitarian vision. All of these characteristics are the result of past actions which often eroded confidence and failed to transcend narrow and short-term perspectives.

Another constraint is the lack of wider interaction among policy makers, leaders, and professionals.

Data inadequacy is another impediment to the formulation of a long-term regional water vision. It is true that a large number of water related data sets have been generated in each country in an isolated manner during the past two or three decades. However, there has been no coordination in terms of the exchange and compilation of these data sets at the regional level. Even at the national level, data generated by different agencies is used and stored in a disjointed fashion. Added to this problem is a lack of transparency and an unwillingness to exchange data among the GBM countries as well as within each country. The free and unfettered flow of data and information throughout the region, along with the generation of new baseline data, are prerequisites for realisation of the vision.

One other constraint is more political in nature and manifested in two ways. Firstly, there appears to be a failure on the part of the political leadership to mould public opinion in favour of developing a vision for regional cooperation. Secondly, preoccupations with national issues have narrowed and clouded the vision so much that any national consensus on the benefits of regional cooperation remains elusive and the issues remain contentious. The onus of removing this constraint lies with the political leadership in each country. Their success will depend first, on an attitudinal shift in favour of regionalism on their own part, and then on their political acumen and capability to motivate others.

Another constraint that has prevented meaningful and durable regional cooperation among the GBM countries is the lack of any institutional framework. At the national level, each country has its own institutions for better resource development and management. Regional or cross border issues have been dealt with bilaterally and often on an ad hoc basis. The Joint Rivers Commission has succeeded to some extent, but has its own limitations in terms of its mandate. In order to envision a truly integrated water resources management for the GBM basin, an apex body needs to be established with a mandate to develop, utilise, and manage the vast potential of water resources in the GBM region.

Conclusion

There is a need for cooperation among countries in the GBM region for the common benefit of all nations through the water-based development of the region, with a focus on issues, not only of national concern and priority, but also of regional relevance and applicability. To derive full and multipurpose utility from the Ganges water, storage dams need to be built. These dams would not only control floods but also provide substantial benefits in terms of hydro-electricity and irrigation facilities. Monsoon storage can also augment dry season flow, improve navigation, and help maintain the ecological balance of the region as a whole.

Integrated river basin development will help to solve not only the flood problem of Bangladesh, but also of the whole region. It will help to ensure the coordinated and harmonious development of various sectors in relation to all the regional responsibilities of the basin. These include irrigation and drainage, electric power

generation, navigation, drought control, watershed treatment, industrial and domestic uses of water, recreation, and wild life conservation. This type of planning will ultimately help the people of the whole watershed to live in a better environment.

There is an urgent need for regional cooperation in the integrated management of GBM waters to meet the multipurpose requirements of the region for the common benefit of co-basin partners. Statesmen, bureaucrats, scientists, and planners from all nations need to agree jointly on the sustainable and equitable use of this continuously wasted resource, as soon as possible. Through regional cooperation, we will be able to manage the conflicts and constraints hindering the maximum utilisation of available water resources in the region. This needs a unity of mind and the implementation of relevant policy.

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Panel Topic – Economic Policies for Sustainable Land Use in the HKH Region

Dr Hari Krishna Upadhyaya, Honourable Member, NPC, Kathmandu, Nepal

Background

Sustainable land use in the Hindu Kush-Himalayas (HKH) is important, not only for the sustainability of the entire mountain ecosystem, but also for the secure and sustainable livelihoods of the people living in this region and downstream. The mountain ecosystem is fragile and vulnerable to both natural and man-made disasters. The majority of the 150 million people who live in the HKH region are poor and suffer from various forms of deprivation. Their livelihood options are limited and predominantly land-based. However, only about 5% of the total land area is arable, and high altitude, steep slopes, and heavy seasonal rainfall limit the use of this land for intensive agriculture. In many areas, land is only suitable for trees and other perennial crops which do not require tilling.

Pressure on the limited arable land has mounted with increases in population. This has led to unsustainable patterns of land use in the region. Deforestation, soil erosion, and many other types of environmental degradation have become common phenomena characterising the HKH region. Genuine concerns are being raised about the sustainability of the entire mountain ecosystem.

Sustainability is about people, and sustainable land use is about how people, individually and collectively, act to meet their needs and aspirations for better living, now and in the future. In meeting the needs and aspirations of the people, it is important to recognise the existence of future generations, but it is urgent to satisfy the livelihood needs of the present generation. This urgency is greater among the poorer people, who lack the ability to produce or purchase enough food to live a normal life. If current land use systems cannot satisfy the needs and aspirations of communities, they have little prospect of being sustainable. The challenge, therefore, is to plan and manage land resources in a manner that not only meets the growing demand for food and other biological products in the present, but also keeps the native productivity of land intact for the future. Economic policies can play a crucial role in this process.

Impact of economic policies on land use

Economic policies affect land use through their impact on agricultural and forestry inputs and product markets. Policies affect the relative profitability of alternative land use patterns. In fact, much of the present-day problem of unsustainable land use in mountain areas is attributable to the macro-economic and sectoral policies that were adopted by countries to achieve certain short-term gains. There are numerous cases where policies designed to address a particular development agenda have had adverse land use consequences. The most obvious among such mistaken policies include timber concessions, subsidies on agricultural inputs, and policies controlling the movement of trees and agroforestry products.

Several studies have shown that timber concessions provided by developing countries, for example in Guyana and Indonesia in the sixties and seventies, were a major cause of the massive deforestation and deformation of mountain regions. Subsidies on agricultural inputs lowered the cost and increased the profitability of agricultural production, leading to the expansion of cultivation into forestlands in the mountain areas of Thailand, Ghana, and other countries. Fertiliser subsidies promoted the excessive use of inorganic fertilisers in some mountain areas. For example, in the mountain areas of East Java, farmers used as much as 1000 kg/ha of chemical fertilisers for potato production. Eventually, many countries adopted strict rules and regulations to control the movement of forest products in order to prevent smuggling. However, such rules and regulations not only failed to achieve their objectives, they also penalised the small mountain farmers who practised tree farming and other sustainable land use practices.

Policies are only as good as their positive impact, and impacts are positive only when policies address the specific factors that constrain sustainable land use in mountain

areas. Among the main constraints are (i) inappropriate financial incentives for people to adopt sustainable land use practices, (ii) unclear property rights, and (iii) inadequate and inefficient credit systems.

Changing to sustainable land use systems – for example, from intensive annual farming to agroforestry or other types of perennial crop farming – involves forgoing significant income on the part of the farmers, at least in the short run. Farmers are unlikely to make changes in their current land use systems unless there are clear economic incentives for them to do so. Similarly, in many countries, property rights are unclear and the state owns forests and land in mountain areas. In the absence of secure tenure rights, there is no incentive for users to invest in conservation efforts. For example, the mountain farmers in Nepal would not have adopted terraced farming without inheritable property rights. Insecure land tenure not only constrains private investment, but it also limits farmers' access to credit, inputs, and other institutional services required for improved land use practices.

The provision of a clear, enforceable, and marketable property rights arrangement is, therefore, indispensable for sustainable land use practices. In most areas, access to formal sector credit is low and particularly limited for the poorer mountain farmers, who need credit the most. Informal credit is costly, and even that is not always available to the poorer people.

The extent to which countries in the HKH region have addressed the above constraints through economic policy is, at best, limited and variable across countries. Clearly, with business as usual, sustainable land use in mountain areas can only remain a wishful development agenda. There has to be a shift in the current approach to sustainable land use policies, from a short-term quick-gain and blanket approach, to one that is based on the careful assessment of long-term impacts, that responds to the specificities and niches of mountain areas, and that satisfies the livelihood needs of the mountain people. An approach that is people-centred and pluralistic.

Economic policy framework for sustainable land use

Promoting sustainable land use systems and securing improved livelihoods in mountain areas are clear policy objectives. However, these policy objectives can be conflicting too. In order to achieve these twin objectives, economic policies must be built upon a clear understanding of the costs and benefits associated with different land use systems; how markets can be created to internalise them; and what kind of institutional service delivery arrangements should be put in place to enable people to sustain the changes. Some of the key intermediate objectives underpinning sustainable land use policies are as follows.

Promote decentralisation and local self-governance

Accumulated evidence indicates that development can happen and be sustainable locally only if local people participate in planning and managing the development. Development without local participation becomes costly and unsustainable. Decentralisation and local

self-governance provide the framework for a people-centred approach to development and for effective coordination among stakeholders at the local level. A people-centred approach is key, as people stand on both the demand and supply sides of sustainability. It is people who initiate unsustainable development, and it is also people who take corrective measures. Moreover, sustainable land use systems often involve collective action, which can more readily take place in a decentralised system.

Create an enabling policy environment for local people's participation

Users are the best managers of natural resources. Nepal's community forestry is a clear example of how, given an appropriate policy and regulatory environment, users can organise themselves and take over the management of natural forests. Over the past decade, following the enactment of the new forestry legislation in 1993, the number of community forest user groups has increased from around 500 to more than 13,000, managing more than a million hectares of forest. Today, many of the community forests that were among the most degraded at the time of handover, have shown improved forest cover and increased biomass. This has resulted in increased access to forest products for the people and reduced the frequency of natural disasters, such as landslides and soil erosion in the vicinity of community forests.

Foster partnerships among stakeholders

A wide range of stakeholders – government agencies, non-government organisations, private sector agencies, individuals, community groups, and farmers – are involved in the process of development and the adoption of sustainable land use practices. No single institution can handle all of the complexities of this agenda. It is only through the integrated and coordinated efforts of all of these stakeholders that a sustainable land use system can be developed and brought into practice. Moreover, government agencies work best when they facilitate the work of others and concentrate on regulatory functions. Policies should, therefore, be geared towards fostering partnerships among all of the stakeholders and forging synergies between their work. This is achieved more effectively through a decentralised development system, as argued above.

Exploit local comparative advantages and niches

Mountain areas are rich in biological diversity and have natural comparative advantages in terms of many products and services. These can be tapped to improve the livelihoods of the people without disrupting the environment. For example, mountain areas have unique prospects for eco-tourism, agroforestry, fruit, and other high-value types of organic farming. Exploitation of the agroecological niches that mountain areas possess can induce changes in the current low-productivity crop production system to high-value commodity production systems, thereby achieving the twin objectives of improving livelihood options and improving the environment. There are examples where farmers have shifted from traditional cereal-based farming to tea or coffee farming and have increased their income several fold.

Improve market access

Most mountain areas lack adequate access to markets for the niche commodities or services produced there, let alone for the improved environmental quality and secure livelihoods that people downstream realise from conservation efforts upstream. Many of the services provided by good land use practices, such as agroforestry, do not fetch any price in the market. Even the agricultural products that are currently produced – for example, apples produced in Jumla district of Nepal – do not get to market due to lack of road access. Improving access to markets for mountain areas is essential to tap the agroecological niches that these areas possess.

Re-orient and strengthen institutions

Many of the public institutions that provide agricultural and forestry services in rural areas have tended to neglect mountain areas. They are poorly oriented to address the unique problems of mountain areas. The re-orientation and strengthening of institutional services in mountain areas is necessary. There is also a need to strengthen the provision of effective institutional support, including research and extension and credit facilities, to enable farmers to adopt sustainable land use systems. More participatory approaches that build on the interests and abilities of local people to manage resources are needed and will require very different incentive structures within public institutions, with greater accountability to the intended beneficiaries.

Improve incentives for sustainable land use practices

There must be an incentive for farmers to move from mono-crop farming to tree farming or agroforestry, particularly when the move involves forgoing income. Mechanisms also need to be developed so that downstream people can compensate upstream people for their conservation efforts. Forest owners upstream are not paid for the services that their forests provide to downstream people. Nor do these forest owners receive commercial profits for capturing carbon, maintaining scenic beauty, or preserving biodiversity resources. The adoption of many environmentally friendly land uses such as agroforestry, tree farming, and horticulture are limited, as financially they are not as attractive as annual cash crops like potato, ginger, and vegetables. It is, therefore, necessary to provide appropriate financial incentives in favour of environmentally sustainable land use practices, as seen in many European countries.

Promote regional knowledge sharing forums

Economically, the countries in the HKH region are among the poorest in the world. However, they are probably the richest in terms of their natural resource base and cultural and biological diversity. There is much traditional knowledge of modern value that these countries can offer to the world to create a better quality of living. However, first, there is a need to promote the documentation and sharing of knowledge and best practices among countries within the region.

Nepal's recent policy initiatives

The Government of Nepal has recently introduced a new Agricultural Policy as an umbrella policy to guide the development policies and programmes of sectoral ministries (mainly those involved in agriculture, forestry, and land reform). Sustainable land use is a key concept inherent in this policy. The new policy has been designed to achieve two broad objectives (i) to address problems, including current apparently unsustainable land use practices, in agriculture and (ii) to tap the niche opportunities provided by mountain ecosystems, especially in the context of increased competition for agricultural product marketing, regionally through the South Asia Free Trade Area (SAFTA) and globally through the World Trade Organization (WTO). Some of the provisions of the new policy document have direct implications for future land use practices including:

- the generation and dissemination of agricultural technologies that help to exploit the natural and local comparative advantages and niches;
- the development and adoption of scientific land use practices, including the promotion of sloping agricultural land technology in mountain areas;
- the promotion of the cultivation and marketing of high-value, low-volume agricultural products in remote and mountain areas;
- the establishment of national agricultural resource centres for each agroecological region to provide integrated extension and development services (production, post-harvest, processing, marketing, and so on) to farmers and agro-processors;
- the promotion of leasehold farming and forestry in waste and degraded public lands to benefit the rural poor, with an emphasis on agroforestry and tree farming on those lands;
- emphasis on organic farming, and provision of quality testing and certification services in export production sites;
- the regulation of production and use of genetically modified organisms;
- the regulation of the use of chemicals in crop and livestock production to minimise their adverse environmental consequences;
- emphasis on the production and use of organic fertilisers in agriculture;
- the establishment of community gene banks and participatory biodiversity parks to promote in-situ conservation; and
- the regulation and control of land fragmentation.

Decentralisation and local self-governance; more effective partnerships and coordination among stakeholders and development service providers; and the re-orientation and capacity development of public sector development organisations constitute the core of this new policy. Increased emphasis has been given to partnerships with private sector agencies and farmer cooperatives for more effective, efficient, and sustainable service delivery.

Panel Topic – Institutional Dimensions of Sustainable Use of Mountain Resources

Dr Tone Bleie, Chief, Gender and Development, UN ESCAP

Introduction

In this brief presentation, I chose to confine myself to posing a few arguments about current and emerging challenges for ICIMOD's research and development efforts, in a region in which longer-term environmental security has particular historical antecedents, and depends critically on improved political stability and governance.

The importance of a historical perspective in understanding institutional dimensions

A historically informed understanding of the political economy, of the regional and sub-regional dynamics of state formation, and of chiefdoms, and of their changed relationship with local institutions involved in the management of natural resources, is required to understand the post-1947 nation-building projects, the emergence of ethnic minorities, migratory patterns, changes in natural resource management regimes, and their environmental and political impact in the Hindu Kush-Himalayan region.

If we look at the region, the areas situated within the northeastern states of India were, in the pre-British period, a patchwork of minor chiefdoms constituting non-state spaces, and some highly centralised states in the Brahmaputra Valley, Manipur, Tripura, and Khasi and Jaintia Hills. A description of a vast semi-isolated mosaic world of bewildering diversity must not deflect us from recognising the erstwhile complicated relationships between lowland states and principalities and hill people. The Thai-Ahom state in the Brahmaputra Valley, for example, succeeded in claiming tributes from hill chiefs, who were granted land rights in the fertile low lands. The ancient state formations of Assam controlled the Brahmaputra River as a main waterway and source of surplus production and control over the north-south gateway for trade and cultural exchange.¹

In the Colonial period, the British only gradually extended their over-rule in mountain regions by granting forms of limited autonomy for a number of strategic purposes. The Chittagong Hill Tracts was an autonomous region under the Moghul Empire until the British East India Company formally acquired the region in 1760. Only much later did the British acquire a firm grip on civil, juridical, and administrative matters by giving some scope for self-rule to chiefs, based on customary law, and yet reducing the chiefs to subordinate territorial lords. As part of the British excluded area policy, high quality land was given to European settlers and to some hill ethnic immigrants, while Bengalis were forbidden entry. The native people of the Chittagong Hills gradually became a minority with restricted territorial rights. In a number of hill and foothill regions in

¹ See S. Baruah (2003) *Journal of Peace Research*, Vol. 40 (No.3); and S.K. Chatterjee (1955) *The Place of Assam in the History of Civilization of India*, Guwhati: University of Guwhati.

Assam the Duars, and in Darjeeling and the Chittagong Hill Tracts the British, in pursuit of revenue and commercial gain, established mono-crop plantations and encouraged a stream of immigrants, as intermediaries and labourers, from the plains and from other neighbouring and more faraway sub-regions. These large-scale interventions necessitated large-scale dislocations of people, and radical reforms of property systems and of management systems for agricultural land, pastures, forests, and minerals. In other pocket mountain areas and provinces, few, or no, such large-scale interventions took place, allowing people to experience a softer, more long-term transition of production regimes and management systems.

For such historical reasons, we may speak of a sub-regional 'northeast', comprising the areas currently situated within Bihar, Jharkhand, West Bengal, India's northeastern states, Sikkim, Nepal, Bhutan, Bangladesh, and the border areas between the Chittagong Hill Tracts and Burma. This extended northeast mountain and plains region has emerged out of exceedingly complex global-regional-national-hill-plains forces, whose shifting constellations have been formed by two causally interconnected historical processes. The first was the unevenly imposed incorporation into the rapidly expanding, mercantile capitalist system through the occupation of the British East India Company, which changed from being a monopoly trade company into an agent of political domination. The other was India's independence in 1947, which, based on the dramatic Partition, led firstly to the formation of two independent states, and later to a third (Bangladesh). This had major repercussions for geo-politics, the kinds of nationalism that developed, the scale and nature of voluntary and involuntary migration, regulatory management regimes, and for the actual pressure on land and other natural resources. The new national borders cut across chiefdoms, areas inhabited by culturally related clans and tribes, and across ancient trade routes and waterways. A country like East Bengal became a lower riparian, India remained both an upper and lower riparian, while Assam became landlocked, and so on.

The centre-state conflicts which have unfolded over the last three to four decades in India's northeast have a multifaceted plains-mountain dimension. This dimension is, to some degree, a legacy of the colonial period when the hills were redefined as hinterlands for plains towns and as portal towns for the extraction of natural resources and of manpower, while commercial agricultural was promoted in selected hill areas based on large-scale deforestation, using migrant labour from the plains and from other hill areas.

The current complex traffic in different kinds of political ideologies by militants, including the emerging and expanding insurgency groups in Bangladesh, Bhutan, India, Myanmar, and Nepal, and the traffic in arms and of refugees and voluntary migrants must be understood against this historical backdrop. Such recognition has major implications for the political scenarios within which ICIMOD has to define its strategic advantages as a regional mountain institution. This recognition may also have a number of implications for ICIMOD's applied research, documentation, and policy formulation, only a few of which I will concretise here. One example is the wider political and security implications of transboundary collaboration, be it in relation to

the management of water harnessing or of biodiversity. Such collaborative efforts may be considered indirect conflict prevention measures. They can also be deliberately used as conflict reducing measures, if based on phased approaches to bilateral and multilateral cooperation that can progressively build confidence and the recognition of common economic and political interests, thereby reducing mistrust and easing acute memories of past grievances that continue to hamper major transboundary collaborations in South Asia.

The scope for multi-disciplinary research and policy work at ICIMOD

Recently, ICIMOD has established an applied research and action programme, Culture, Equity, Gender and Governance (CEGG), that aims to facilitate the development of institutions that may strengthen mountain peoples' ability to negotiate and manage resources effectively (see www.icimod.org). This innovative programme aims at being thematically cross-cutting, which is quite a challenge in view of ICIMOD's past history of sectoral, rather than technical programmes.

ICIMOD's future applied research and policy work on social institutions and local governance needs to intensify the study of both so-called informal and formal institutions. This study should look at changes to institutionalised rules and how different social actors, as a result of their gender, age, caste, and ethnic status, exercise very different collective agency in formulating and accepting rules and regulations, in acting against rules and regulations, and in renegotiating such rules in more or less equitable directions. The very nature of such regulation has to be better understood. In striving for greater analytical clarity, I would argue that multi-disciplinarity remains a challenge for ICIMOD. In line with my above argument, historically informed anthropologists, sociologists, and geographers – preoccupied with the embedded nature of social space, institutional changes and resource use, social agency, and inequity in entitlement – might profitably collaborate with economists applying, for example, the social choice theory to the empirical study of people's agency, social inclusion in institutions (including those managing natural resources), democracy, difference, and justice.

Anthropologists can offer rather sophisticated empirical descriptions and analyses of the multiple structural dimensions of indigenous and local institutional changes, while economists should be able to contribute to model the predominant rules and aggregated outcomes that go beyond aggregating individual preferences, attending to issues of collective choice, social inequality, and social justice.²

Understanding group formation processes and their underlying logic and policy implications

ICIMOD's region-wide mandate includes an emphasis on assisting to create and support economic, environmental, and social options for sustainable resource

² For a discussion of Amartya Sen's contribution to feminist economics and gender analysis, see *Feminist Economics*, Special Issues 2 and 3, Volume 9, 2003.

management and poverty alleviation and to delineate development priorities for the region as a whole. It follows from this mandate that it is important to generate relevant research-based knowledge of local survival and coping strategies in situations of mass migration; changes to real agricultural wages; changes to the division of labour (between men, women, and children); unequal access to property, credit, and markets; political instability; the emerging effects of large-scale environmental changes; and the increasing number of sponsored and semi-traditional self-help groups.

In view of ICIMOD's current and future role in problem solving research, and in facilitating networking and collaboration at all scales, we have to understand why mountain people form groups; what kinds of group functions take place; which kinds and what level of inclusion and exclusion exist along gender, ethnic, and caste divisions; and the nature of the interfaces between and within groups at the micro, meso, and macro-levels. Take community forestry user groups, about which there is a massive body of literature, but in which scant attention has been paid to basic issues of social inclusion by gender, ethnicity, and caste status, although it is well known that upper caste men often dominate these groups. There is also a need to compare group formation processes and functions across sectors. How do other approaches to social mobilisation in agricultural extension and management fare compared to the group water irrigation sector or group formation in the energy development sector? If we start examining the interactions between micro, meso, and macro-levels, they might vary with the organisational structure of non-government organisations, federations, and cooperatives.

Granted, in the usual situation, where multiple social and economic inequalities and a number of sponsored, traditional, and semi-traditional groups compete for the time and resources of household members, the opportunity cost of participation is often too high for particular categories of households, such as poorer households and households with a skewed adult dependency ratio. The various implications of such partly non-inclusive group formation processes are important to study, to monitor, and to document, and not least the formation of group-based federations at national and even at sub-regional levels, aiming to gain political influence and improve livelihoods and social justice.

The Federation of Community Forestry Users, Nepal (FECOFUN), for example, has been challenging the Nepalese government on both legal and policy issues since the Forestry Act came into force in 1993. This organisation has also attempted to become more socially inclusive, by introducing measures to include women forest users. It is of particular importance to scrutinise the resulting nature of social inclusion, including the political agency of women in this Federation as compared to other federations. ICIMOD and its partner organisations have an important role to play in collecting and disseminating evidence of good and not so good practices in influencing policies, the sustainable and more equitable management of natural resources, and in promoting employment, trade, and social justice. FECOFUN might be but one such example. Obviously, there are many other promising and established innovative change agents that are not really acknowledged, perhaps because their achievements are not

substantially donor funded, or they may even be completely out of donor circuits. Creating donor and media publicity about these political and social innovators has, of course, to be done with great caution in order not to encourage a sudden overkill of donor support, or to pressure prematurely for the delivery of a blueprint model expected to be replicated at national and regional levels.

We may perhaps again use a political economy approach; this time in order to examine the reasons why NGOs and federations compete for donor support and why donors compete for very publicly visible roles as partners. We also need to understand why some dalit and women's groups are responding positively to the call of militant political groups for violent struggle. My argument makes me recall Professor Bruno Messerli's opening lecture, in which he drew attention to a poignant drawing made by a 16-year old girl. Is this girl now one of these unacknowledged heroines who have contributed to more equitable group formation and improved livelihoods? Or, perhaps she is no longer alive, considering the still staggeringly high mortality rate of women in this country. Whether she is alive or not, does she have daughters who have joined the Maoists and are among the young women fighters who are determined, if necessary, to die to achieve a more just society? While we cannot, here and now, answer these questions, we should ask them.

Recalling again ICIMOD's mandate, the promotion of people-centred development; the facilitation of scaling up at local, national, and sub-regional levels; the struggle for institutional power for grassroots movements; and the democratisation of decision making will remain major challenges for this important regional institution in the coming decades.

Panel Topic – Sustainable Management of Biodiversity

Professor Jamuna Sharan Singh, Professor of Botany, Department of Botany, Banaras Hindu University

Mountains are among the most fragile and complex ecosystems in the world. They cover about 24% of the land surface of our planet, with diverse regions stretching from the equator almost to both poles. They are the centre of major global biological resources and home to 12% of the global human population. Over a billion people depend on the mountains for goods and services such as water, food, forest products, and recreation. Additional billions of people benefit from other mountain services including the provision of energy and minerals, biodiversity-based goods, and many environmental services. In recent years, mountains have also played a pivotal role as indicators of climate change. However, in the global developmental perspective, mountains are the most challenging area, with little or practically no development. The communities living in these fragile and rich ecosystems are the poorest of the poor and marginalised. Conservation and developmental activities are often limited, hindering the sustainability of mountain resources. The ever-increasing population and their needs have imparted immense pressure on available resources. A promising mechanism for sustainable development is necessary to address these challenging issues.

Strengthening ecological coherence and resilience is necessary for both biodiversity conservation and sustainable development. This has attracted growing attention in a wide range of conservation and development forums. The world community looked into the mountains of the world more deeply and raised its voice against marginalisation, poverty, inequity, and lack of access to economic development. The inclusion of Agenda 21 in the United Nations Conference on Environment and Development in Rio de Janeiro in 1992 was a great step towards realising the significance of the world's mountains. Realising the importance of mountains in the global conservation scenario, another major initiative was taken by the UN General Assembly in the year 1998 with a resolution sponsored by 130 countries to proclaim the year 2002 the International Year of the Mountains. A total of 78 countries took active initiatives to form a partnership that led to a World Summit on Sustainable Development (WSSD) devoted to this plan. The WSSD was held in Johannesburg in September 2002 and adopted the goal of securing a significant reduction in the current rate of biodiversity loss by 2010. Similarly, in the year 2003, the World Parks Congress addressed conservation with a more holistic approach with a theme of 'Conservation Beyond Boundaries'. The Congress led to a paradigm shift from conventional conservation measures to a more participatory process towards an equity and co-management concept. Recently, in 2004, the Seventh Conference of Parties to the Convention on Biological Diversity (CBD) adopted a wide-ranging programme of work on mountain biological diversity.

As part of the implementation of the global agenda for the effective management of biological resources, various global initiatives have been taken to conserve existing biological resources for their sustainability. The creation of protected area networks has long been one of the main strategies to safeguard the world's biodiversity. In the last couple of decades, more than 100,000 protected areas have been established worldwide on 12% of the global land area (compared to IUCN's global target of 10%). This initiative is playing an important role in addressing the objectives and decisions adopted during the various meetings of the Conference of Parties to CBD. The efforts of the Millennium Ecosystem Assessment analysis of priority issues, initiatives taken for conservation through the Critical Ecosystem Management Fund, implementation of the Millennium Development Goals, and inclusion of prominent mountain development and conservation goals of CBD through different Conferences of Parties are all addressing the global need for effective conservation measures. However, these initiatives have not addressed biodiversity conservation and sustainable development issues adequately. There is a strong gap in the understanding of the economic aspects of biodiversity for sustainable development. To date, conservation has been undertaken only on a small scale, mostly focusing on the conservation of biological resources inside protected areas. The past exercise in conservation by the establishment of protected areas has limited the coverage of biodiversity components that are found outside the protected areas. Thus, the effectiveness of protected areas for global biodiversity conservation is questionable.

The Hindu Kush-Himalayan (HKH) region is unique as the youngest and most fragile of the great mountain regions of the world. The intrinsic fragility of its ecosystems has made it one of the most critical areas of the world. It is a land of water towers that

supports the economic well-being of tens of thousands of people through its services; more than any other mountains in the world. Moreover, a most unusual feature of the HKH is its great biological wealth and diversity of global importance, enriched by its complex topography, climatic variability, and the meeting of Indo-Malayan, Indo-Chinese, as well as Himalayan and Indian peninsular elements.

Considered one of the 25 global 'biodiversity hotspots', the HKH region is under tremendous pressure from a burgeoning population and human related development activities. Rapid urbanisation, habitat degradation, and weak conservation measures in the region have resulted in a drastic decline in biodiversity. There is an inexorable link between poverty and environmental degradation, each reinforcing the other. This is due to the economically, physically, and socially vulnerable condition of the mountain communities living in the area. Thus, the most pressing challenge in the HKH, and elsewhere, is to conserve biodiversity by pursuing different economic incentives for sustainable livelihood options for the local communities who have been the custodians of these resources since time immemorial.

Simply stated, sustainable development implies the use of the ecological system in a manner that satisfies current needs without compromising the needs or options of future generations. The sustainable management of biodiversity cannot be isolated from sustainable development. Species and ecosystem services have to be valued in economic terms to place them in the proper perspective. So far, the conservation measures taken to safeguard biodiversity and its sustainability have been ineffective and insufficient. Moreover, the conservation of biodiversity through protected areas alone is ill suited to developing countries where there is a higher dependency of people who are economically, physically, and socially vulnerable on these resources for their subsistence. Conservationists have often been reluctant to take conservation measures over land occupied by people because of the possibility of social disputes and the associated cost of managing conflict. Thus, conservation initiatives are often purely ecologically oriented and ignore social driving forces and the relationship between conservation and the sustainability of resources for future human needs. Therefore, a balance between the natural habitat and the human dominated landscape is the only option left. This will determine the sustainability and conservation of biodiversity.

In recent years, efforts to conserve biodiversity have gradually begun to shift, away from law enforcement and use restrictions, towards more participatory approaches emphasising the equitable and sustainable use of natural resources by local communities. This change in approach is important in the remote rural areas of developing countries where biodiversity is concentrated, poverty pervasive, and development programmes often limited. This has led to a new emphasis on finding ways to derive economic opportunities from biological resources, as it is neither politically feasible nor ethically justifiable to deny the poor the use of natural resources without providing them with alternatives. Many models of biodiversity conservation and sustainable development have evolved – from the species to the landscape management level. A few approaches to biodiversity management in the HKH region apply policies that are appropriate for both the technological and institutional aspects

of the development and conservation of biological resources. These include (a) participatory forest management, (b) enterprise-based community-involved biodiversity management, and (c) a landscape approach to biodiversity management. The landscape (transboundary) approach is relevant because biodiversity does not recognise political boundaries.

Examples of participatory forest management, such as joint forest management in India; community based natural resource management in Bhutan; community forests and leasehold forestry in Nepal; and the National Biodiversity Strategy and Action Plan initiatives of the GEF, are often cited as success stories for the regeneration of degraded forests. Similarly, examples of enterprise-based community-involved participatory conservation initiatives, such as biodiversity and ecotourism in Sikkim, India; mountain tourism development initiatives by ICIMOD; participatory buffer-zone management in Royal Chitwan National Park in Nepal; and medicinal plant-based enterprise development by Dabur and ICIMOD in Humla and Jumla in Nepal, have proven to be other means of achieving sustainable development vis-a-vis effective biodiversity conservation. These practices show that biodiversity management by the people becomes more evident when it has a utility value and when communities benefit from it.

The ecosystem approach to conservation is another means of conservation that has gained momentum in recent years. Initiatives for a regional collaboration on transboundary biodiversity management using a landscape approach in the HKH region have become instrumental to collaborative conservation efforts in transboundary landscapes. There is evidence from the Mount Everest ecosystems, the Hkakaborazi mountain complexes, the Kangchenjunga complex, and the Terai Arc landscape of collaboration and community participation making a substantial contribution to conservation and sustainable development.

However, these examples seem more like islands of success, yet to be scaled up. There is a potential for community based biodiversity management, economic sustainability, capacity building, cooperation, and partnerships to address effectively conservation and sustainable development. Thus, being a regional knowledge management and learning centre, there are unprecedented opportunities for ICIMOD to convert vulnerability into opportunity. There is a need to support assessments of biodiversity; the creation of a database; the identification of hyper-diversity areas, site-specific threats, and mitigation of threats; and to promote the sustainable use of biodiversity. There is enormous opportunity for the development of manpower skilled in biodiversity conservation and use who could act as meaningful partners. There is great potential for enterprise development in relation to non-timber forest products and medicinal and aromatic plants in the region. However, such initiatives need more attention all along the value chain, with systematic efforts being made in backward, forward, and horizontal linkages.

Community based biodiversity management, in the context of the HKH region, is complex due to diverse cultures, ecological variations, differences in climatic regimes, and difficult terrain. Due to the complexity in the region, transboundary biodiversity conservation and landscape management issues are best addressed through regional cooperation following the various approaches and criteria experienced by ICIMOD during its last 20 years of mountain development initiatives. To conclude, the aim of sustainable development should be to maximise human well-being and quality of life without jeopardising the life support environment.

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Discussion and Recommendations: Working Session II

The plenary discussions after the presentations in Working Session II focused on two key issues:

- 1) Conflict in the region and the impact of globalisation, and
- 2) Regional cooperation on issues such as water resources management.

The discussions included comments on how to recognise the early warning signs of conflict – especially as outside influences occur rapidly and abruptly – and the need for intervention at the early stages.

The discussion also focused on the important issue of regional cooperation on issues such as water resources management. Although partnerships are now being developed to address this, there is still much more to do, especially at the regional level.

At the end of each presentation and discussion, recommendations were also made that would help set the future direction of ICIMOD. Some of the most important made during Working Session II are listed below.

- Ensure the enhancement of the role of women as agents of change in changing gender roles and in playing a role in community affairs (rebuilding societies with greater social and economic justice).
- There is a need to understand indigenous peoples' knowledge, and in particular women's knowledge, and their traditional checks and balances in managing CPRs.
- Appropriate technologies should be developed for upland and mountain regions that address rural poverty and that are acceptable to farmers. There is a need to develop rural non-farm activities for livelihood improvement, and for micro-finance including savings (not just credit) to help develop these activities.
- There is a need to promote peace in mountain areas by promoting social justice, human rights, and the elimination of unequal power and development relations.
- There is a need for integrated water resources management, which could solve many problems in the case of Bangladesh as the control, or lack of control, of water flows upstream affect both floods and droughts downstream.
- ICIMOD could help to develop economic policies for development to promote sustainable land use systems and institutions.
- There is a need to understand the historical context of the formation of formal and informal institutions and states in the HKH region. It is also very important to understand and work with women's groups in mountain regions, as they are often the agents of change.
- The following points should be considered in relation to biodiversity conservation and the sustainable development of biodiversity:
 - assess and collect data about the immense biodiversity in the HKH region,
 - consider site specific threats and mitigation,
 - sustainable use and value addition,
 - restoration using appropriate interventions,
 - conservation outside protected areas, and
 - scaling up of transboundary approaches and methodologies appropriate for public participation.