




# **Securing Sustainable Livelihoods in the Hindu Kush-Himalayas**

Directions for Future Research, Development and Cooperation



**ICIMOD 21<sup>st</sup> Anniversary Symposium**

# About ICIMOD

The **International Centre for Integrated Mountain Development** (ICIMOD) is an independent 'Mountain Learning and Knowledge Centre' serving the eight countries of the Hindu Kush-Himalayas – Afghanistan , Bangladesh , Bhutan , China , India , Myanmar , Nepal , and Pakistan  – and the global mountain community. Founded in 1983, ICIMOD is based in Kathmandu, Nepal, and brings together a partnership of regional member countries, partner institutions, and donors with a commitment for development action to secure a better future for the people and environment of the extended Himalayan region. ICIMOD's activities are supported by its core programme donors: the Governments of Austria, Denmark, Germany, Netherlands, Norway, Switzerland, and its regional member countries, along with over thirty project co-financing donors. The primary objective of the Centre is to promote the development of an economically and environmentally sound mountain ecosystem and to improve the living standards of mountain populations.

# **Securing Sustainable Livelihoods in the Hindu Kush-Himalayas: Directions for Future Research, Development and Cooperation**

Proceedings of the ICIMOD 21<sup>st</sup> Anniversary Symposium,  
held 5-6 December 2004, in Kathmandu, Nepal

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**Back cover:** ICIMOD staff in front of the new headquarters building  
(*file photo*)

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The affiliation and professional positions of the various participants were those current at the time of the meeting.

# Foreword

ICIMOD's 21<sup>st</sup> Anniversary Symposium not only commemorated a major milestone in our evolution, but also a physical move to our new headquarters at Khumaltar, Kathmandu, Nepal. The Symposium was an ideal occasion to reflect on the Centre's achievements over the past two decades and to discuss its future direction. The Symposium was therefore aptly titled 'Securing Sustainable Livelihoods in the Hindu Kush-Himalayas: Directions for Future Research, Development and Cooperation'. Keynote speakers and panel members from around the region and beyond were invited to share their experiences in relation to the Centre's achievements and to provide recommendations for the future. His Majesty the King of Nepal, Gyanendra Bir Bikram Shah Dev, graced the occasion by inaugurating the new headquarters and opening the Symposium. The inaugural session was attended by dignitaries from His Majesty's Government of Nepal, the diplomatic corps based in Kathmandu, and high-level government representatives, scientists, and academicians from within and outside the Himalayan region.

The participants at the Symposium acknowledged the valuable contribution made by ICIMOD to the development of the Hindu Kush-Himalayan region. Not only has ICIMOD helped in sensitising policy makers to the plight of poor communities in mountain areas and flagging their vulnerability to socioeconomic and geopolitical insecurities, it has also played a key role in identifying mountain technologies and community-based natural resource approaches and policies that have helped to significantly improve the livelihoods of mountain peoples. Some of the leading personnel associated with ICIMOD's creation, as well as representatives from its Regional Member Countries, expressed their satisfaction with the active role that ICIMOD has been able to play in facilitating the exchange of information, knowledge, and expertise among the Member Countries, thereby enhancing understanding and cooperation among them in addressing sustainable development and disaster mitigation issues. This was considered a commendable achievement given the sensitive geopolitical relations that continue to pervade the region. The reflections at the Symposium testify to the growing importance of ICIMOD as a regional learning and knowledge centre for mountain development with an increasing global role and recognition.

In discussing ICIMOD's future, participants voiced their concerns for the persistent and emerging challenges facing the greater Himalayan region. Poverty continues to plague many mountain communities, and the degradation of natural resources and the environment continues despite positive reversals in some areas. The impact of climate change on mountain ecosystems, the pressure on the natural resource base, threats to the conservation of biological diversity, continuing social unrest and political tensions within the region, along with increasing discrepancy between the rich and poor, high

and low status groups, upstream and downstream, were some of the key challenges identified for the region.

ICIMOD has a key role to play in addressing these issues as the implications of many of them transcend geopolitical boundaries and require a coordinated approach from the countries in the region. With the adoption of market economy approaches by the Regional Member Countries and increases in mobility and access to information and knowledge, as well as a significant improvement in bilateral relations between the Member Countries, the opportunities for cooperation to address the challenges and harness potential benefits have increased. There was general agreement that the Regional Member Countries could benefit significantly from the adoption of a regional approach to disaster mitigation, biodiversity conservation, eco-tourism, and hydropower development. The participants agreed that ICIMOD could play a key role in facilitating this approach in the coming years.

This report is a record of the Symposium proceedings and is intended to serve as a valuable reference for mountain peoples, researchers, policy makers, and development practitioners in mountain areas. It also documents an important phase in the continuing evolution of ICIMOD as a truly international centre for excellence in sustainable mountain development. I am grateful to all the speakers, participants, and my colleagues at ICIMOD who made the 21<sup>st</sup> Symposium a great success.

Dr J Gabriel Campbell  
Director General  
ICIMOD

# Acronyms and Abbreviations

AKRSP	Agha Khan Rural Support Programme
CBD	Convention on Biological Diversity
CIS	Commonwealth of Independent States
CO	community organisation
CPR	common pool resources
DSS	decision support system
FAO	Food and Agriculture Organization
FECOFUN	Federation of Community Forestry Users, Nepal
GBM	Ganges-Brahmaputra-Meghna
GEF	Global Environment Facility
GIS	geographic information system
GPS	global positioning system
HIMAWANTI	Himalayan Grassroots Women's Natural Resource Management Association
HKH	Hindu Kush-Himalayas/n
HP	Himachal Pradesh
ICIMOD	International Centre for Integrated Mountain Development
ICSU	International Council for Science
IFAD	International Fund for Agricultural Development
INGO	international non-government organisation
IUCN	The World Conservation Union
MAB	Man and the Biosphere
MACP	Mountain Areas Conservancy Project
MENRIS	Mountain Environment and Natural Resources Information Systems
NA	Northern Areas
NGO	non-government organisation
NTFP	non-timber forest product
NWFP	North West Frontier Province
RSP	Rural Support Programme
SASMON	South Asia Mobilization Network
UN	United Nations
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNU	United Nations University
WSSD	World Summit on Sustainable Development

### **Note**

The papers in this volume have undergone language editing, in some cases without further review by the authors.



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# **Introduction and Inaugural Session**



## Introduction

From its establishment in 1983 until 2004, the International Centre for Integrated Mountain Development (ICIMOD) rented offices in Jawalakhel, in Kathmandu's sister city of Lalitpur. Following the generous contribution of 1.5 hectares of land by His Majesty's Government of Nepal in 2000, ICIMOD constructed its own headquarters at Khumaltar (4 km south of Jawalakhel). A state-of-the-art architectural design by renowned architect Tom Crees was selected in 2001 from a number of bids. The foundation-laying ceremony took place in December 2002 in the presence of members of the ICIMOD Board of Governors and the ICIMOD Support Group. Construction started immediately afterwards. Despite many constraints, work progressed largely on schedule and the building was completed by the end of 2004 – and ICIMOD moved into its new headquarters building. This was indeed a milestone, heralding a fresh beginning for the mountain development institute.

## The Symposium

ICIMOD celebrated the inauguration of the new building together with its 21<sup>st</sup> Anniversary by holding a symposium on 5-6 December 2004 on 'Securing Sustainable Livelihoods in the Hindu Kush-Himalayas: Directions for Future Research, Development and Cooperation'. The purpose was to reflect on the Centre's achievements over the past two decades, to look at future challenges in the Hindu Kush-Himalayan (HKH) region, and to contribute towards the improvement of regional cooperation and knowledge sharing. The specific objectives were:

- to draw lessons from the success and failures of the past twenty years;
- to identify contemporary and emerging challenges, posed by global warming and climate change, to the environment of the HKH region; and identify priority research and development needs in relation to long-term environmental security;
- to identify contemporary and emerging socioeconomic challenges and opportunities faced by mountain communities; and
- to strengthen ownership of the Centre by the Regional Member Countries and to strengthen partnerships at various levels between civil society, research and development agencies, government and non-government agencies, the private sector, and the international community in order to improve the sustainability of the Centre and its services

There were nearly 100 participants including high-level government officials, members of ICIMOD's Board of Governors, representatives of donor agencies, representatives of Regional Member Countries, international non-government organisations (INGOs), and non-government organisations (NGOs), and academicians, researchers, and development professionals from the social and natural sciences. Eminent scientists from the development field in the social and natural sciences and members of ICIMOD's Board of Governors were invited as keynote speakers and panellists. The Symposium Sessions were planned according to ICIMOD's new Medium-Term Action Plan strategy on 'Partnerships in Mountain Development, Securing the Future of the Hindu Kush-Himalayas'.

The proceedings of the symposium are presented in the following: the contributions to the Inaugural Session, Sessions I to IV, and the Closing Session are presented in separate sections; the programme and list of participants are provided in the Annexes. The sessions were prepared in the form of a keynote presentation followed by shorter presentations from a group of panellists and a plenary discussion in which the floor was open to the participants who put questions to the speakers. The rapporteurs of each session summed up the main findings and recommendations in a concluding session. In some cases the speakers prepared a full paper for publication, in others the main contents of the presentation was transcribed from recordings, notes, and slides used in the presentations.

## **Opening Speeches**

### **Welcome Speech**

*Dr J Gabriel Campbell, Director General, ICIMOD*

Your Majesty, your Excellencies, the ICIMOD Board of Governors and Support Group Members, distinguished mountain scholars, development practitioners, and all other mountain lovers and friends. Thank you for joining us on our 21<sup>st</sup> birthday as we mark our maturity with a new home. Thank you for helping us to celebrate the excitement of continuing our mission to serve mountain people and environments in Afghanistan, Bangladesh, Bhutan, China, India, Myanmar, Nepal, and Pakistan, as well as the rest of the mountain world.

ICIMOD was founded 21 years ago by some of you sitting here today as a bold idea. It was founded with a deep personal and professional commitment to bettering the lives of millions of poor mountain peoples and to reversing the accelerating deterioration of their environments. It was founded on the idea that mountain peoples had more to learn from each other, than from technical and socioeconomic solutions developed for the plains below. It was founded with the hope that the magnificent natural resources, the glorious diversity and depth of cultures and adaptations developed in the mountains, and the spiritual inspiration and renewal that they have provided to peoples of all beliefs, could be saved, and that these resources could be nurtured, cherished, and safeguarded for the benefit of poor mountain peoples and for the hundreds of millions of people relying on these treasures for their lives downstream. Perhaps most boldly, ICIMOD was founded on the agreement of eight countries in a region better known for tensions and occasional hostilities than for setting up institutions for regional collaboration.

Ladies and gentlemen, ICIMOD's founders were not only far seeing, they were right. Their ideas have stood the test of time. Their vision is now shared by many throughout the world, and the number of mountain regions establishing their own versions of ICIMOD is increasing. The knowledge and insights that have grown out of ICIMOD's work are now enshrined in the world's documents – the Rio Earth Summit<sup>1</sup>, the

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<sup>1</sup> United Nations Conference on Environment and Development (UNCED), Rio de Janeiro, 3-14 June 1992

Johannesburg World Summit on Sustainable Development<sup>2</sup> – and more importantly, in the numerous policy and programme decisions made by mountain states and provinces, operational departments and NGOs, farmers and their husbands throughout our region.

Mountains are different. We have to live in them differently, respecting and responding to their dynamic movement of snow, ice, water, and soil – their immense variation of eco-niches, habitats, challenges, and opportunities. It costs more to live in the mountains – more calories to move up and down, more investment to build roads or deliver services. But then mountains give us more; they are the primary source of our water, our hydroelectric potential, our biological diversity, and our spiritual sustenance.

Unfortunately, mountains are also often home to immense hardship and poverty, and social and physical vulnerability. Their residents have often suffered from less access to health, education, infrastructure, markets, and opportunities. Too many of their peoples, especially the socially excluded and women, have suffered from discrimination and, despite the best efforts of governments in the region, become vulnerable to the path of violence. The disproportionate level of violent conflict found in our mountain regions – here and all over the world – is unfortunately one more indicator of how right our founders and supporters were and are in focusing on the need to address more effectively the plight of mountain peoples.

We can point to these terrible and tragic problems in our mountain homes and ask: have we failed? And In one sense, we have to say, yes, we have failed. Failed to deliver the level of livelihood improvement, of hope, of peace and security that all our mountain peoples want and deserve. And that is why we must redouble our efforts, and learn how to make them more effective. We must learn how to redesign them so they empower, and bring self-respect, voice and dignity to the mountain peoples we seek to serve.

For although we have, in part, failed, we have also succeeded to a degree our founders might find hard to believe.

Where poverty levels exceeded 40% in many areas of the Hindu Kush-Himalayas 20 years ago, they have now been reduced to 8-30% throughout the region. Where the overwhelming majority of households did not have access to drinking water, electricity, and schools several decades ago, now they do. Where deforestation rates were so high 25 years ago that vast moonscapes were being predicted, today there are many areas where there is actually more forest cover than at that time, and the rate of loss has been drastically reduced. And today, while there are still pockets of abject poverty, we now have many areas of relative prosperity – even in remote mountain valleys like Solu Khumbu in Nepal, Kulu in India, Swat and Gilgit in Pakistan, Paro in Bhutan, and some minority areas of Western China to name a few.

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<sup>2</sup> World Summit on Sustainable Development (WSSD), Johannesburg, 26 August-4 Sept. 2002

In all of these examples, the initiatives of local communities, combined with supportive government policies and programmes, and often NGO grassroots activity, have been instrumental. These actions have transformed poverty into prosperity and degradation into regeneration. Learning from and supporting the spread of these kinds of initiatives, so that hundreds of thousands of mountain peoples and the millions downstream can lead better, happier lives, has been our mission at ICIMOD.

Your Majesty, ladies and gentlemen, we would not be here today, in this wonderful new headquarters if it were not for the extraordinary dedication, commitment, and generosity of many people, organisations, and countries.

In addition to our founders, my predecessors at the helm of ICIMOD – Peter Gueller, Colin Rosser, E. Frank Tacke, and Egbert Pelinck – have made outstanding contributions to building this institution and, along with our superb Deputies – Ram Yadav, Mahesh Banskota, and Binayak Bhadra – have negotiated our role and relations in the region and worldwide, and provided the intellectual guidance for us to grow from a child to our current maturity.

Our core programme donors, starting with co-founders Switzerland and Germany and now extending to Austria, Denmark, the Netherlands, and Norway, along with our other ICIMOD Support Group Members and programme co-financers, many of whom are here today, have not only provided the sustenance for our work, but also valuable critical and constructive guidance at every step of the way.

Our Regional Member Countries, through their multiple levels of support – financial, administrative, intellectual, and moral – are the reason that we exist at all, and the basis for our legitimacy. Through their representation on our Board of Governors, and even more, through their support for our key partners throughout the region, our mission is anchored in their priorities and needs. With additional expert guidance and generous voluntary support from our Independent Board Members, the Board of Governors has shown remarkable vision, foresight, and responsibility in helping ICIMOD to grow into the young, yet mature, institution that it is today, with bright and dedicated staff from throughout the region and the world. It is they who work with our partners, the backbone of our work, many of whom are also represented here today. Our job is to facilitate your work, to give it synergy, and a regional and global dimension to multiply its impact. I am proud that your presence here today is testimony to the strength of the partnerships upon which we are built.

Your Majesty, I have left until last our most important debt of gratitude. That is to Your Majesty's Government, to its committed officials, and our many Nepalese staff whose consistent professional and generous support, policies, and collaboration have not only made our work go smoothly and effectively, but have also provided us with a source of personal joy and delight. Nepal's innovations in development policy – whether in community forestry, buffer zone management, hydroelectric power, ecotourism, or other areas – continue to provide a source of inspiration and learning for us to share throughout the region. In addition, Nepal's welcoming policies, open visa requirements



for the Regional Member Countries and their participants, and support for ICIMOD as an international organisation continues – despite the current problems – to make Nepal the best location for a regional institution such as ourselves.

Your Majesty's personal commitment to conservation and sustainable development, as amply demonstrated by the hundreds of hours you devoted as chair of the King Mahendra Trust for Nature Conservation, a partner organisation, has also served to inspire policies and commitments that positively frame our work in this field.

Finally, Your Majesty's Government's generous allocation of land, first for our ICIMOD Test and Demonstration Centre at Godavari, and now for the site of our first permanent home, is a true tribute to Nepal's enduring friendship. The splendid generosity of our Regional Member Countries, Bangladesh, Bhutan, China, India, and Pakistan, in providing special contributions to this headquarters is extraordinary, and highly appreciated.

Your Majesty, we thank you for inaugurating our new home and gracing this occasion. We thank the officials of your Government, especially in the Ministries of Agriculture, Population and Environment, and Forestry and Soil Conservation for providing us our homes in Nepal.

I request all of us here to express our appreciation at this time with a round of hearty applause.

Thank you all for joining us today. Dera manana, danyabad, kadinche, xe xe, kyae zu tin bar dae, shukria, thank you.

## **Inaugural Address**

*U Soe Win Hlaing, Chairperson, ICIMOD Board of Governors, and Director General, Forest Department, Myanmar*

Your Majesty the King of Nepal, distinguished dignitaries, colleagues, and friends, may I join the Director General of ICIMOD in extending a very warm welcome to His Majesty the King and express our sincere gratitude to your Majesty for graciously consenting to grace this occasion and inaugurate the Centre's new headquarters and its 21<sup>st</sup> Anniversary Symposium.

Coming from the southeastern part of the Hindu Kush-Himalayas, I am indeed delighted and honoured to be here with my fellow Board members to participate in such an important and historic moment for ICIMOD. The presence of so many high level representatives from the Regional Member Countries and eminent scholars and professionals from the region and abroad is a testimony to the significance of ICIMOD's role as a mountain research and development centre. I have no doubt that, with this level of support, ICIMOD will be able to enhance its role and relevance in the coming years. Let me, therefore, thank you all for taking time out to be with us here, to launch this new chapter in the Centre's history.

The establishment of ICIMOD's new headquarters is indeed a milestone, which would not have been possible without the generous offer of land from His Majesty's Government of Nepal. We hope that ICIMOD will be able to honour the trust and confidence placed in it by its host country in the years to come by playing a lead role in supporting development programmes. I understand that the funds for construction came from reserve funds accumulated by strong core and project donors and direct contributions from the Regional Member Countries. On behalf of the Board of Governors, let me express our sincere appreciation to all of the donors, including the Regional Member Countries, for their generous contributions in various forms. Your support has made it possible for ICIMOD to have its own premises here in Khumaltar. This magnificent new facility will enable ICIMOD to better integrate its programmes and improve its services to its member countries.

The holding of this Symposium is the first step towards a rejuvenated ICIMOD and, hence, it is aptly titled 'Securing Sustainable Livelihoods in the Hindu Kush-Himalayas: Directions for Future Research, Development and Cooperation'. Towards this end, the main purpose of the Symposium is to reflect on the Centre's achievements over the past two decades and to look ahead to meeting the challenges and harnessing the opportunities emerging both globally and regionally.

I am confident that this Symposium will be successful in coming up with useful recommendations to serve as a basis for inspiring ICIMOD's future research and development agenda, and in fostering closer cooperation among the countries and peoples of the HKH region.

May I thank your Majesty, the King of Nepal, once again for your august presence and wish your Majesty continued good health. The brave people of Nepal deserve our sincere appreciation for having us here, despite all of the problems Nepal is currently going through, and we join them in praying for a speedy return to peace, stability, and prosperity for this great country.

Thank you.

## **Inaugural Address**

*Mr Jochen Kenneweg, Chairperson, ICIMOD Support Group*

Your Majesty, distinguished dignitaries, members of the ICIMOD Board of Governors, ladies and gentlemen, colleagues, and friends. On behalf of the ICIMOD Support Group, which comprises representatives of the Regional Member Countries, and international and bilateral donors, I wish to thank His Majesty the King for the great honour of his presence on this occasion and for inaugurating ICIMOD's new headquarters. With sincere and deep gratitude, we acknowledge that the government of the Centre's host country, the Kingdom of Nepal, again made a decisive contribution to the further development of ICIMOD by generously allocating this valuable and

beautiful piece of land. This contribution has allowed ICIMOD to find a well-situated and apparently very appropriate new home. It is yet another indication of the country's endeavours to foster cross-border cooperation in the region. This unperturbed determination is shown at a time when Nepal itself is facing very difficult challenges to its internal stability, its economy, and development.

The headquarters building and pavilions are visible proof that there is a strong and growing ownership of ICIMOD by the Regional Member Countries. Extraordinary contributions, remarkable both in number and size, have gone into this project. It gives rise to hope and expectation, as the material base for the Centre's present and future activities lies in the preparedness of governments, institutions, groups, and people to render support voluntarily and continuously.

To carry out its many activities in applied research, training, project work, networking, and communication ICIMOD received, from 1982 to 2003, in terms of financial resources, a total of 65,785 million dollars. In addition, we have to consider the numerous contributions in kind from the Regional Member Countries and the many co-financing arrangements with partner institutions. The value of these support components should not be underrated, although they are difficult to quantify in monetary terms.

In order to keep or enhance the interest of its supporters, and to gain new ones, the Centre will have to maintain the attractiveness, relevance, and professional standards of its programmes as much as the quality of its relationships with partner institutions in the region and beyond. I would agree with the views expressed recently in an ICIMOD internal assessment, which points out ICIMOD's comparative advantages. They surely comprise ICIMOD's competence in the research and development of natural resources and ecosystems, as well as the Centre's ability to engage people and institutions from the eight quite different countries in the Hindu Kush-Himalayan region in discussing many issues, even sensitive ones such as transboundary biodiversity and water management.

I believe that the exchange of highly qualified staff between the Centre and the Regional Member Countries plays a crucial role here.

The success of ICIMOD has to do with both continuity and readiness to change and adjust to rapidly changing circumstances. While the primary objectives of the Centre – to “help to promote the development of an economically and environmentally sound mountain ecosystem and to improve the living standards of mountain populations” – remain as valid as they were 20 years ago, there are now new challenges such as the necessity to cope with conditions of violent conflict or the requirement to take into account the effects of accelerated globalisation and climate change. Whereas ICIMOD has enjoyed, throughout its history, a remarkable continuity in the financial support received from a few European core donors, the rapid and multifaceted development in some of the regional countries calls for their greater involvement in the funding of the

Centre. Long-standing partnerships between ICIMOD and major institutions in the region have their merits and advantages. On the other hand, development and research activities may have become sustainable without direct ICIMOD involvement. Changed emphasis in programme content, the choice of respective strategic lead partners, and capacity building requirements may lead to shifts in the Centre's priority partnerships.

Because of the professional quality of ICIMOD's staff, the reputation of the Centre, and the experience gained in developing and maintaining partnership relations, I believe that we can be confident that ICIMOD will be in a position to face the challenges ahead successfully. The new premises will surely provide a conducive environment.

I wish to congratulate ICIMOD, and all who feel a sense of ownership of this valuable organisation, and for having a new and beautiful home.

Thank you.

## **Inaugural Address**

*Mr Bachaspati Devkota, the Honourable Minister for Population and Environment*

Your Gracious Majesty, the Right Honourable Prime Minister, your Excellencies, Professor Messerli, Chairs of the ICIMOD Board of Governors and ICIMOD Support Group, participants, ladies, and gentleman. Firstly, let me offer my sincere gratitude to Your Majesty for gracing this occasion and inaugurating the ICIMOD building today. It is indeed a great honour to receive Your Gracious Majesty.

The history of the International Centre for Integrated Mountain Development (ICIMOD) began with the seed of an idea, sown in Munich in 1974. Inspired by the concept, His Majesty's Government of Nepal offered to host the proposed Centre and the offer was accepted in 1979 at a United Nations Educational, Scientific and Cultural Organization's Man and the Biosphere programme (UNESCO-MAB) meeting in Kathmandu. This led to the establishment of ICIMOD on this very day, December 5<sup>th</sup> in 1983, with the assistance of its founding sponsors UNESCO, the Government of Switzerland, the Federal Republic of Germany, and His Majesty's Government of Nepal.

At the time that ICIMOD was established, there was a dire need to address the deterioration of mountain habitats and the rapid depletion of valuable species. At the inaugural symposium in Kathmandu, the call was for integrated and sustainable mountain development in the vast Hindu Kush-Himalayan region. We have come a long way from that time, but there are still, as the poet says: "miles to go before we sleep". This is why we need ICIMOD more than ever today, to carry us along that hardest of journeys, the last mile, and to ensure a better future for the 120 million people living in the world's highest and most rugged mountains.

Throughout, I believe that Nepal has not only been the host country, but also a good friend. Good friends enjoy their friendship, and friendship means practical help,

sharing, giving, and receiving. On the side of His Majesty's Government of Nepal, the early request by ICIMOD for land for a headquarters building led to an area being apportioned in Kirtipur; and subsequent infrastructural changes led to this land in Khumaltar being made available.

ICIMOD, today, has opened its own headquarters' building, and it is a very impressive building indeed. In addition, as Minister for Population and Environment, I would like to draw your attention to another piece of land not far away from here – the ICIMOD Demonstration and Training Centre at Godavari, made available by His Majesty's Government in November 1992. Today, the hillside flourishes with best farming practices, improved livestock, water harvesting, bees, and alternative energy. It is a demonstration of land well used and skilled husbandry that conserves the riches of the environment.

However, more important than buildings and sites is the work that ICIMOD has successfully carried out over the last twenty-one years. That work has been in direct collaboration with Nepal, regional countries, and the core donors of Austria, Denmark, Germany, the Netherlands, Norway, and Switzerland. In addition to these are other donors, too numerous to mention here, but to whom we are extremely grateful. ICIMOD has assisted the Ministry of Population and Environment in establishing the first Mercury Station in Nepal, assisted with the State of the Environment assessment, the Male Agreement on air quality monitoring, and the formulation of an IT policy for Nepal. ICIMOD also provided initial training in mountain risk engineering and then together with Tribhuvan University, landslide and hazard control, beekeeping, GIS training, and, more recently, brought Nepal and other regional countries together for flood hazard management and control.

The last 21 years have been productive and fruitful. As a good friend, on behalf of His Majesty's Government of Nepal, I would like, with the Government, to congratulate ICIMOD on this magnificent achievement and thank the Regional Member Countries for their generous contributions to this headquarters. We wish ICIMOD the best for a productive and flourishing future and assure the Board and staff of ICIMOD of His Majesty's Government's continuing, full support in the future.

Thank you.

# **Keynote Address – Securing Sustainable Livelihoods in the Hindu Kush-Himalayas: Directions for Future Research, Development and Cooperation**

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## **The political setting: ICIMOD – 21 years in a rapidly changing mountain world**

The inauguration of ICIMOD in 1983 took place between the Stockholm Conference on the Environment in 1972, and the Rio Earth Summit on Environment and Development in 1992 with its Agenda 21 and the mountain chapter 'Managing Fragile Ecosystems – Mountain Sustainable Development'. In these 20 years from 1972 to 1992, the awareness for the mountains and their natural and human resources reached such a level that the mountain chapter was accepted unanimously for the Agenda of the 21<sup>st</sup> century.

Looking more precisely at these 20 years between 1972 and 1992, UNESCO's Man and the Biosphere Programme (MAB), in particular MAB-6 'Man's Impact on Mountain Ecosystems' in 1973, had a profound effect on mountain research and development in general, and on the foundation of ICIMOD in particular. The first ideas for a regional centre were discussed in the UNESCO-MAB meeting on 'Integrated Ecological Research and Training in the South Asian Mountain Systems, especially in the Hindu Kush-Himalayas', held in Kathmandu in 1975. UNESCO's General Conference of 1976 supported such a centre and the General Conference of 1978 approved paragraph 2410, which authorised UNESCO to provide its support to the creation of at least six regional centres on integrated ecological research, training, and documentation. In 1980 the name 'Regional Centre' was changed in a quadripartite meeting of the four founding sponsors (UNESCO, Nepal, Germany, and Switzerland) to 'International Centre for Integrated Mountain Development' (personal information from Dr. Gisbert Glaser, former Assistant Director General of UNESCO, who played a leading role in the foundation of ICIMOD).

The inauguration of ICIMOD took place in 1983, eight years after the first discussions. During this apparently long preparatory process, the main aims and topics of the future ICIMOD were elaborated; they were presented at the inauguration symposium in 1983 (Glaser 1984, p.61). Twenty-one years later, here in a new inauguration symposium, these objectives and responsibilities are well summarised in the title 'Securing Livelihoods in the Hindu Kush-Himalayas: Directions for Future Research, Development and Cooperation'.

For this short retrospective, we could not find any information on the aforementioned UNESCO decision to create at least six regional centres on integrated ecological research, training, and documentation. For the mountains of Africa and South America very different types of organisations, compared to ICIMOD, were established. In Africa,

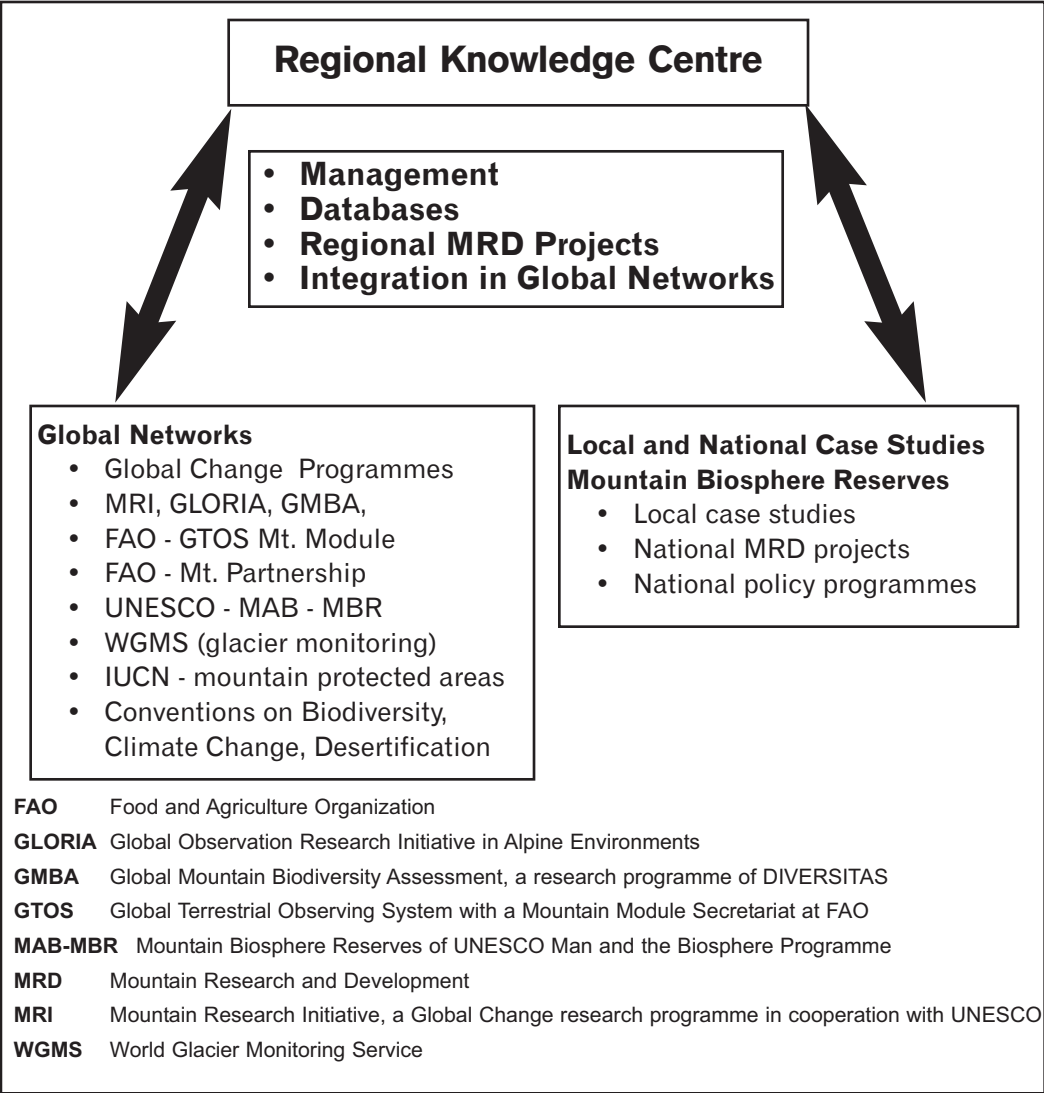
the mountains are scattered all over the continent and isolated from each other. With this in mind, and supported by UNESCO, the United Nations University (UNU), Switzerland, and other sponsors, the first international mountain workshop was held in Ethiopia in 1986 to discuss the formation of the African Mountain Association. Following this, meetings were held in Morocco in 1990, Kenya in 1993, Madagascar in 1996, Lesotho in 2000, and Tanzania in 2002 to enlarge the knowledge base, support the growing scientific community, and to increase the awareness of mountains and their resources in Africa. A similar process was observed in the Andes. The first international workshop held in Santiago de Chile in 1991 led to the foundation of the Andean Mountain Association. This was followed by meetings in Bolivia in 1995, Ecuador in 1998, Venezuela in 2001, and Argentina in 2005. Even though these two organisations were quite new and vulnerable, together with the much stronger partner ICIMOD, they represented the main mountain systems of the developing world, and they became, together with UNU and UNESCO, the driving force for a successful intervention in the preparatory meetings for the Rio conference in 1992 and for the successful formulation of a mountain chapter in Agenda 21 (Mountain Agenda 1992).

However, listening to the discussions in the corridors at the Rio conference, we could tell that the importance of mountains was not properly understood by many of the political delegations. Rather, it was assumed that mountain agriculture and forestry, natural hazards, nature conservation, and mountain development were part of national policies and competences, which could hardly be classified as having international or even global importance. This perception changed for the better five years after the Rio Earth Summit, at the United Nations (UN) Special General Assembly in New York in 1997. It was at this point that the political delegates began to understand that mountains are not only important water towers for an increasingly thirsty planet, vast resources of cultural and biological diversity, sensitive indicators of climate and environmental change, vital recreation areas for an ever more urbanised world population, sacred places for various cultures and religions, and uniquely privileged regions of protected areas, but also sites of erosion, risk, and disaster with damaging effects on the surrounding lowlands (Mountain Agenda 1997; Messerli and Ives 1997). Altogether, over 50% of humanity may depend, in one way or another, directly or indirectly, on mountain resources. The mountains of the world with their natural and human resources were no longer merely of local and national concern, they had become globally significant in and for the 21<sup>st</sup> century.

Based on this new understanding, the debate on an 'International Year of Mountains' had a well-established foundation. As a consequence, it is interesting that all political delegates were prepared to discuss mountain policies, even policies concerning national level procedures, which would never have been possible 10 years before at the Rio Earth Summit. This progress was clearly documented in the title of the glossy brochure distributed at the 'World Summit for Sustainable Development' in Johannesburg in 2002: 'Sustainable Mountain Development – The Need for Adequate Policies and Instruments' (Mountain Agenda 2002). The cycle from the national level, with the defence of national competence and sovereignty, to the global level, with all aspects of solidarity and cooperation, and back again to the national level, with

measures and policies, has played and will play a fundamental role with all its aspects of research, development, and cooperation.

This discussion on the political setting for ICIMOD and the mountains of the world would not be complete without mentioning the rapidly growing interest in mountains shown by various UN bodies; the Global Conventions on Climate Change, Biodiversity, and Desertification; scientific programmes like Global Environmental Change, with its human and natural dimensions; the Food and Agriculture Organization's (FAO) Global Terrestrial Observing System, with its special Mountain Module; and the Millennium Ecosystem Assessment (Figure 1). All of these have led to much stronger cooperation between political and scientific communities and institutions. It is no longer possible for local and national scientific projects to provide the necessary data to understand



**Figure 1: Schematic view of a regional knowledge centre**



the driving forces in a globalised world. On the other hand, to verify global processes it is absolutely necessary to have the 'ground truth' from local and national projects. We need regional knowledge centres with the necessary infrastructure and competence to evaluate, or even participate in, global programmes, and to transfer important information from the national and local level to the regional and global level, and vice versa, for a true verification of ongoing processes.

Figure 1 is a schematic presentation of a regional knowledge centre. The mountain regions of the western United States of America are beginning to establish such centres. ICIMOD has had a much longer history and experience and could even be used as a model for these institutes. It is most important to establish, not only local-regional-global interactions, and vice versa, but also to initiate cooperation between the scientific and political communities in order to discuss strategies for sustainable mountain development with continuous adaptation to the changing natural and human environmental conditions in the mountain world.

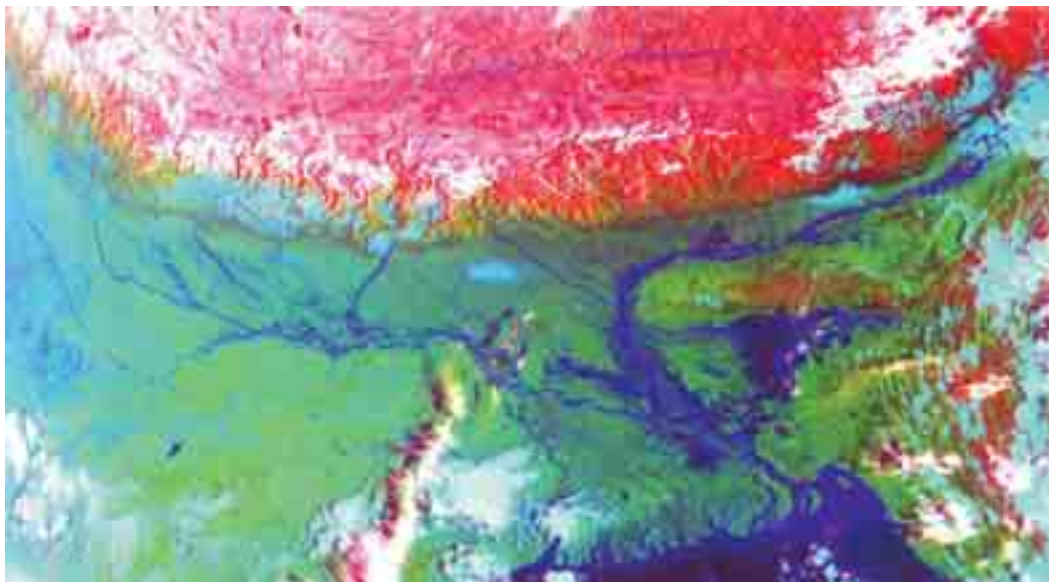
## **Directions for future research, development, and cooperation**

Is it possible that a strong connection between research, development, and cooperation can produce results with a higher value for a future oriented strategic planning and sustainable development? Two examples will be discussed, one more dominated by the natural sciences, and the other more dominated by the social and economic sciences. Each one is illustrated with a case study on a large and on a small scale.

### *The water problems in the Himalayas*

The satellite image in Figure 2 shows the late monsoon flood situation in the Ganga-Brahmaputra-Meghna Basin on 8 October 1988, one of the worst flood years in the 20<sup>th</sup> Century. The first floods occurred as early as mid-April to mid-May in some parts of Bangladesh. The Meghna and Brahmaputra experienced a severe flood in July. A nationwide flood occurred roughly between August 20 and September 5 along with the peaking of all three major rivers. Until October, a significantly above average flow continued to be recorded on the Brahmaputra and Meghna rivers. Accordingly, the satellite image, not only shows the receding waterfronts at the end of an extreme flood year, but also highlights some features of the three rivers that are typical of many flood situations of the 20<sup>th</sup> century.

The Meghna and Meghalaya Hills: The most striking element of this image is the vast flooded area adjacent to the Meghalaya Hills (maximum altitude approximately 2000m) produced in part by flash floods in the hills. Cherapunjee is situated on the southern ridges of these hills and hosts a world famous climatological station. Cherapunjee has an average annual precipitation of more than 10 metres and an extreme annual precipitation of more than 20 metres. These extreme values illustrate the effect of this first orographic barrier on the monsoon coming in from the Bay of Bengal.



**Figure 2: Satellite image showing flooding in Bangladesh on 8 October 1988**

(Source: NOAA data acquired by the Bangladesh Space Research and Remote Sensing Organisation, SPARRSO; image obtained through ITC)

The Brahmaputra in Assam and Bangladesh: It is interesting to note the connection between high discharge and flooded areas along the Brahmaputra from the most eastern corner of Assam to central Bangladesh, but not in southern Bangladesh. Obviously, there is an export of surplus water from Assam to Bangladesh through the Brahmaputra. However, locally produced rain floods within Bangladesh are very important as can be seen in the flooded area north of the lower Ganga, which does not have any connection to the mountains or big rivers. In contrast to the flooded area along the Brahmaputra and Meghna, there is no flooding along the Teesta River, which originates in the Darjeeling Himalayas.

The Ganga and the Western Himalayas: While there is no flooding of the Ganga just before its confluence with the Brahmaputra within Bangladesh, several patches of flooding can be seen further upstream between Patna, Allahabad, and Delhi. Many of these floods have no direct link to the Ganga. According to an article published in a Kathmandu newspaper on 5 December 2004 (Shandip 2004), an expert from Bangladesh stated in a scientific meeting that: “immediate real time information of rainfall and flood events in Nepal can save life and property in Bangladesh”. The interpretation of this satellite image clearly calls for a revision of such statements. Assuming a flow velocity of about 130 km/day, a flood wave from Nepal will require several days to reach the Bangladesh border and, more importantly, the discharge peaks from Nepal will almost certainly be levelled out once they reach the plains.

The interpretation of this satellite image clearly calls for abolishment of the myth that deforestation in the Himalayas is responsible for floods in Bangladesh. This issue is explained and discussed in much greater detail in other publications (Ives and Messerli

1989; Hofer and Messerli 2005). A recent statement by the Director General of the Centre for International Forestry Research in Bogor, Indonesia, clearly supports our findings: "The claim that deforestation leads to big floods is bad science, and it is ruining the lives of poor farmers" (Kaimowitz 2004).

Good science can be highly significant for development in the lowlands of Bangladesh and India – helping people to find the right approaches within the lowlands themselves, rather than from outside, with well-balanced non-technical and technical solutions – as well as for the highlands of Nepal, Bhutan, and India – supporting good sloping land agriculture and forest management. However, development is only possible with cooperation. As shown by the satellite image, water crosses international borders. Water management can create conflict, not only about water control in relation to floods and droughts, but also about water use for energy, irrigation, industrialisation, and urbanisation. Without cooperation, there can be no peaceful development of the Hindu Kush-Himalayan region.

In July 1987 we sent an application in the name of the United Nations University to the Government of India's Central Water Commission, River Data Directorate, for access to discharge data from selected Himalayan rivers. In August, we received the following answer: "We regret our inability to supply such data for research as a matter of policy". We had hoped for a different answer as it should be policy to cooperate with science and with neighbouring countries. This important issue was taken up in an ICIMOD database group workshop (UNESCO, FRIEND, and ICIMOD 1999), but without any great success. All institutions in the Himalayan countries should be reminded that the International Council for Science (ICSU) has published a statement which applies to all member countries, called the 'Statement on Freedom in the Conduct of Science' as follows.

"Scientists must have free access to each other and to scientific data and information. On the basis of its firm and unwavering commitment to the principle of the universality of science, ICSU reaffirms its opposition to any actions which weaken or undermine this principle." (ICSU 2004)

India, Nepal, and China are national scientific members of ICSU, and Bangladesh and Pakistan are national scientific associate members. This means for ICIMOD that the majority of Himalayan countries should follow these guidelines. If they do not, ICSU can intervene in order to establish the necessary cooperation.

Having discussed the large scale, it is interesting to look at a small-scale example of the water problem. The results from a water quality analysis conducted in the Jhikhu Khola watershed, not far from Kathmandu, are of interest. In relation to public water sources, 24 of the total 27 sites tested had a high level of microbiological contamination (chloroforms) based on World Health Organization (WHO) guidelines. Wells within village areas showed the same microbiological contamination, plus high levels of nitrate. Of 10 samples taken from rainwater harvesting sites, only two were clean (Schaffner 2002). This example shows that scientific data can contribute to

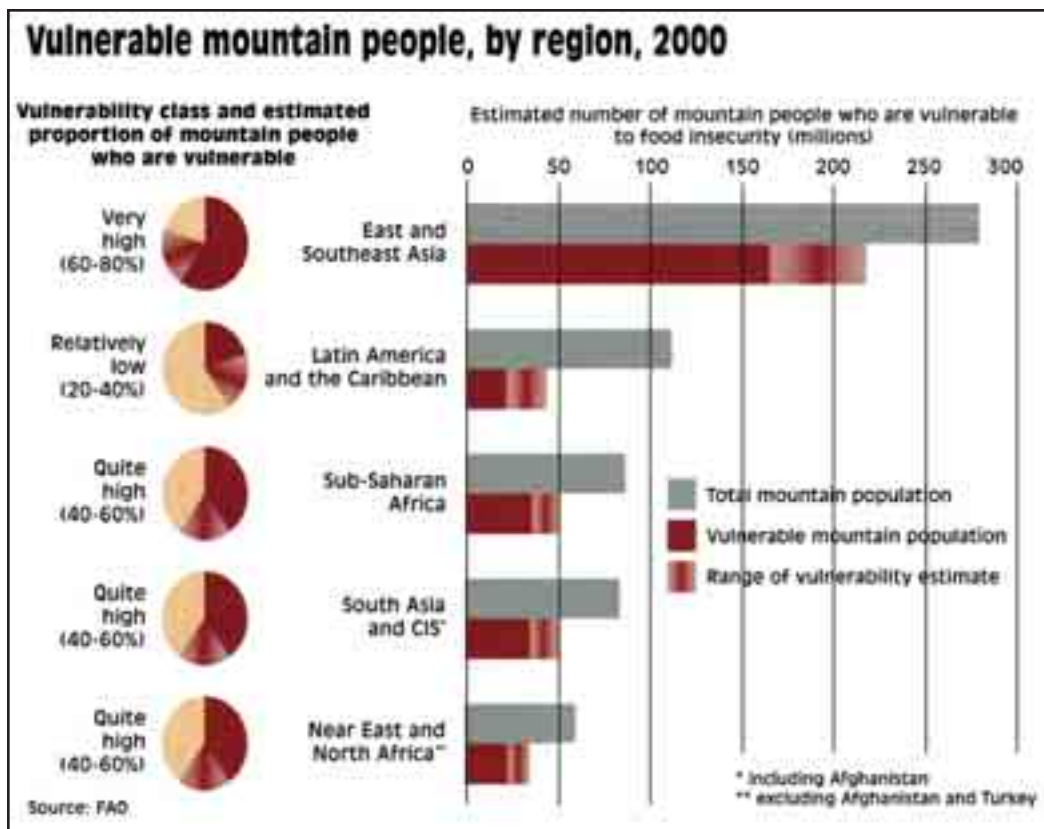
better and healthier development, but again cooperation is need to protect sources and wells and to ensure the regular checking of groundwater and the whole water supply system.

Looking at these two examples, we should not forget that both small and large scale water problems are strongly related. Any input in the highlands has an effect on the lowlands. This is well known from sediments or from excessive nutrient and pollutant input from land use intensification. The long-distant transportation of organic and metal pollutants can have serious consequences for aquatic biota and human health in lower catchments and adjacent plains, particularly where there is a cumulative impact from many sources (Schreier 2002).

### *The food insecurity problem in the Himalayas*

FAO estimates that the total number of mountain people in the year 2000 was about 718 million (Figure 3). Of these, 625 million lived in developing countries and the Commonwealth of Independent States (CIS) of the former Soviet Union. There were about 280 million people in the mountains of East and Southeast Asia, and 80 million in South Asia and CIS (FAO 2002; FAO 2003). It is a pity that there are no separate figures available for the Hindu Kush-Himalayas, but, in cooperation with FAO, these figures could certainly be produced for the Hindu Kush-Himalayan region. Most interesting is FAO's estimate that about 40% of mountain areas in developing countries produce less than 100 kg of cereals per person per year. Rural people living in such locations have difficulty in obtaining an adequate livelihood from agriculture. FAO used population estimates together with other qualitative information to arrive at a preliminary estimate of the number of mountain people who are vulnerable to food insecurity. Based on current information, more than half of the mountain population in developing and CIS countries (250-370 million people) are vulnerable to food insecurity (see Figure 3). This estimate of vulnerability should not be confused with FAO's estimate of undernourished people. Typically, about half of those identified as vulnerable are also undernourished (FAO 2002). Without taking into consideration all of the factors and constraints which may contribute directly or indirectly to food insecurity – like climatic conditions and extreme events, water availability, soil quality, social and cultural aspects, lack of education and health services, and nonexistent integration in local markets and the national economy – we must accept that food insecurity is an important and integrating factor in the vulnerability of a society.

Downscaling from the worldwide FAO survey to Nepal, we see the reality of food vulnerability reflected in the following data. In 1981, out of 75 districts, only eight were food deficient, by the year 2000 the number had probably risen to 33. Scaling down to the village and household level, a field study by Bohle and Adhikari (1998) in the districts of Nawalparasi and Kaski showed that only a small minority had food self-sufficiency for the whole year, and between 41 and 68% had food self-sufficiency for less than six months. This small-scale data is like a 'ground truth' for the large-scale FAO survey. It reveals a dramatic food insecurity in the 1990s, several years before the FAO study was published. However, we should keep in mind a comment made by the authors of this study about the struggle for survival in rural Nepal: "Nepalese mountain



**Figure 3: Food insecurity in the mountains of the world** (Source: FAO 2002)

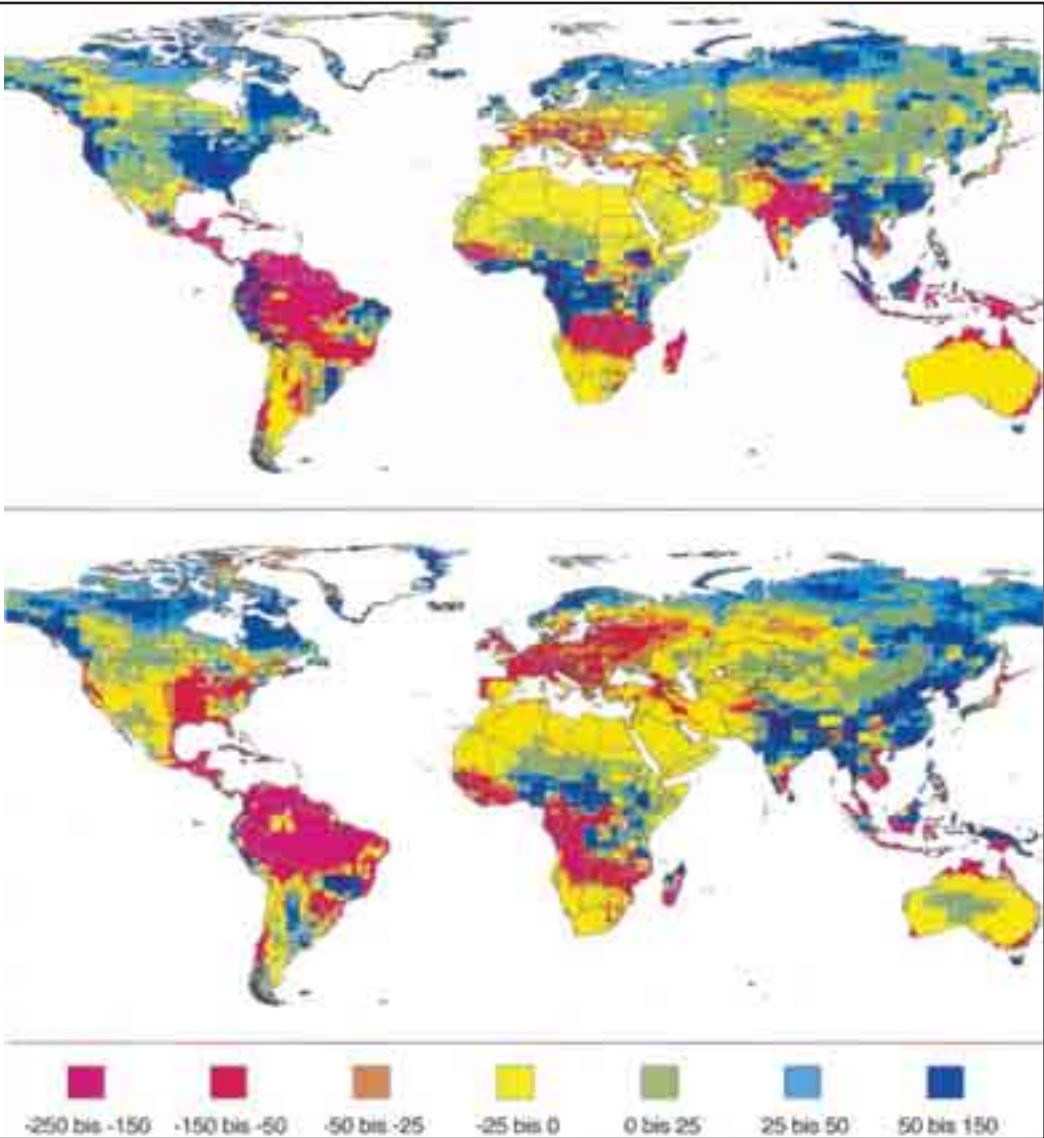
farmers are by no means passive, inflexible, ignorant victims of unsustainable development; they are highly active, adaptive and dynamic actors” (Bohle and Adhikari 1998). This fight for survival is very impressive, but it is no long-term solution for securing sustainable livelihoods, as the beginning of the Maoist insurgency has shown.

The situation may be very different for an area relatively close to an important market place, such as the Jhikhu Khola watershed located about 40 km from Kathmandu. In Jhikhu Khola, the average annual crop rotation changed from 1.6 in 1982 to 2.8 in 2001. This was a most welcome improvement to farmers’ incomes, but it raises new questions. One of these questions is how to maintain soil fertility under such intense use? A large phosphorous deficit was identified and corrected with phosphorous fertiliser from Japan, however, other deficits can be observed. How much more intensification is possible, and what are the problems with maintaining other macro and micronutrients for sustainable soil fertility and agricultural production (Schreier, H., UBC, Vancouver, 2004, personal communication)?

All of these examples, from large-scale statistical analysis to small-scale field-based studies, again illustrate the significance of integrating research, development, and cooperation for adequate and sustainable solutions. This is especially important in a time of global environmental change with its natural and human induced driving forces



(Jodha 2000). These processes also create uncertainties, as can be seen in the prediction of potential changes in future water availability. Figure 4 shows two versions of a general circulation model and their consequences in relation to the change in annual water discharge. The modelling process was based on an annual increase of 1% CO<sub>2</sub> in the atmosphere. It is astonishing and alarming to see the fundamental differences between the two models for the Himalayas and the plains of India and Bangladesh (IPCC 2001). One version shows a trend towards more runoff and perhaps more extreme events. The other version predicts more droughts. What would be the consequences for food production and for all aspects of sustainable development? All that we can do is to observe carefully the progress of scientific methods and models;



**Figure 4: Projected changes in the annual average discharge for the year 2050 in mm/annum compared to data from 1961-1990** (Source: IPCC 2001)

to measure the changes in climate and hydrological cycles; to adapt development programmes according to new knowledge; and to reflect the consequences continuously on the natural-human life support system. All of this is only possible with strong interaction between research, development, and cooperation.

## Securing sustainable livelihoods in the Hindu Kush-Himalayas

Figure 5 maps armed conflicts in the world in 2001 – maybe surprisingly the highest density of armed conflicts were in the Hindu Kush-Himalayan region from Afghanistan to Myanmar. These conflicts may have very different historical, political, cultural, social, or economic causes, but they raise the same the question: why do these conflicts fall so clearly along mountain ranges or occur in mountain countries? Are there some common reasons that make mountain populations vulnerable to conflict?

Poverty, despite all the differences, could be a common problem linked to conflict. In these mountainous areas, poverty can also mean food insecurity, missing resources, and a fragile environment. A poor society is a vulnerable society. As Mahatma Gandhi said: “To the millions who have to go without two meals a day... God can only appear as bread”. Instead of ‘God’, you could say a ‘political ideology’ or ‘religious fundamentalism’, as we see in these mountain countries. In this context we have to remember again the results of Bohle and Adhikari’s study (1998), which was based on field data from 1996 and 1997, and earlier information showing the same poverty and



**Figure 5: Armed conflicts in the world in 2001** (Source: courtesy of Professor A Wenger, Director of the Centre for Security Studies, Swiss Federal Institute of Technology, Zürich, Switzerland)

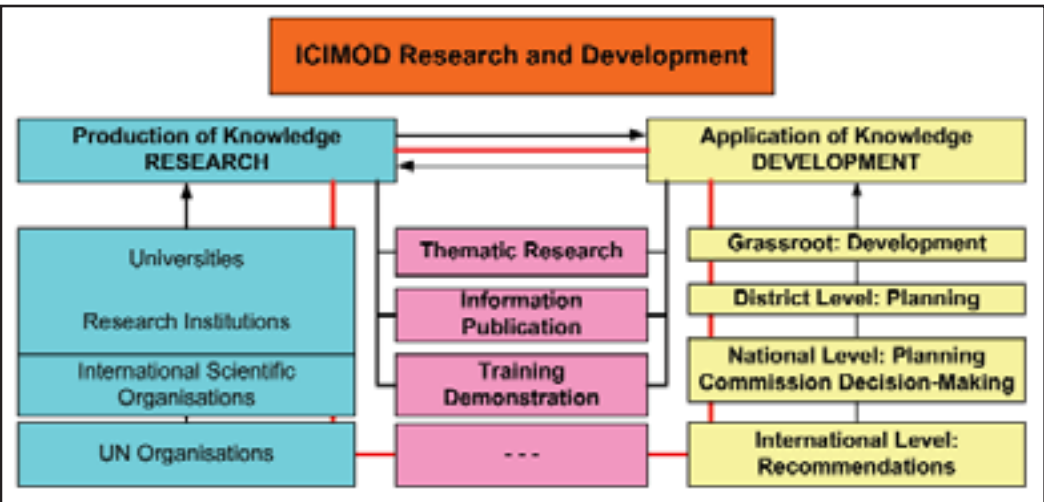
food insecurity from 1992, several years before the beginning of the Maoist movement in Nepal (Metz 2003; Upreti 2004). Would it not be possible to develop a set of significant indicators for assessing the vulnerability of a mountain population as an early warning system for political leaders and decision makers, who are too often too far away from the reality of life in a harsh mountain environment?

In this context it was fascinating indeed to see that five days after the end of the 21<sup>st</sup> Anniversary Symposium of ICIMOD, the UN International Mountain Day on 11 December 2004 was dedicated to the theme ‘Peace, Key to Sustainable Mountain Development’. In addition, an FAO (2004) leaflet, dedicated to this International Mountain Day, read:

“Peace on High – the importance of reducing conflict for mountain development. Many of the more than 800 million chronically undernourished people in the world today live in mountain areas. In some cases, their food insecurity is a consequence of population growth, which often has a harder impact on poverty in mountainous regions because of the fragility of the natural resources. But one of the greatest causes of poverty and hunger in mountain regions is the chaos created by armed conflicts. In 1999, 23 of the 27 major armed conflicts in the world were being fought in mountain regions.”

Conclusion

Looking back over the last 21 years, it is interesting to see the development of ICIMOD from its inauguration in December 1983 to the first quinquennial review panel report in August 1990. Figure 6 shows the state of the discussion in this report, about 15 years ago (Messerli 1990; Muhammed et al. 1990). On the research side, the UN and other international scientific organisations are mentioned, but only in the last decade did their global or regional programmes became highly significant as important sources of knowledge. The development side shows the different levels of planning,



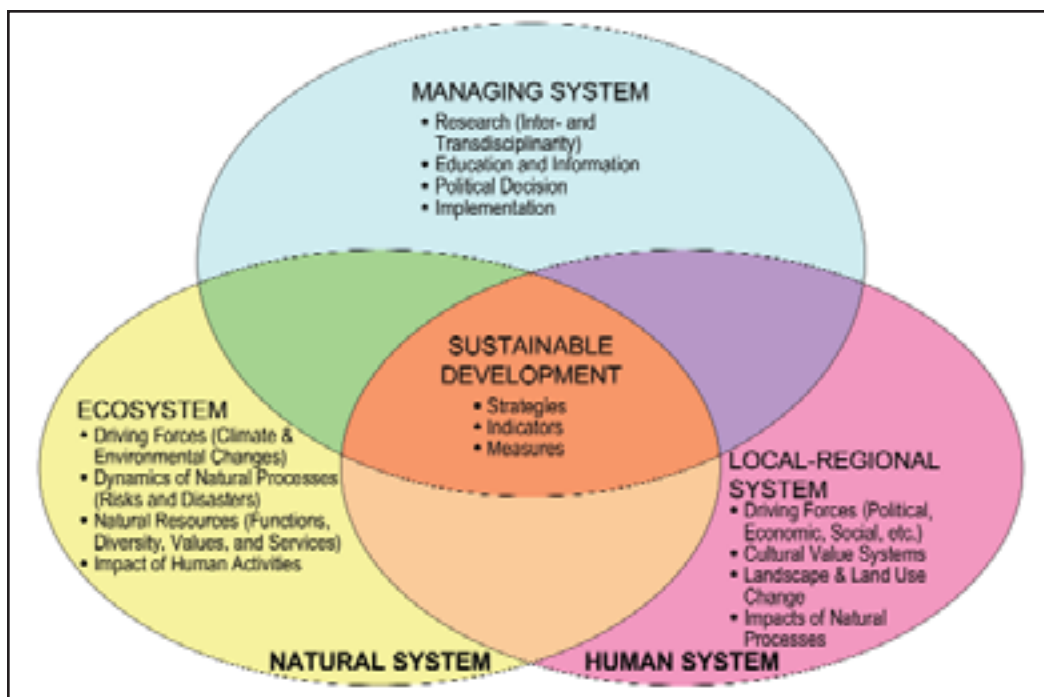
**Figure 6: Report of the first quinquennial review panel of ICIMOD, presented in August 1990** (Source: Messerli 1990; Muhammed et al. 1990)



decision-making, and implementation. In the central frame, the main aims and topics of ICIMOD are mentioned, but of course in a very generalised way. All the same, this figure represents, at least in a first and very preliminary way, the title of the 21<sup>st</sup> Anniversary Symposium 2004: Directions for Future Research, Development and Cooperation.

Looking forward we must take into consideration the new position of the mountain world and its resources in the international political arena since the Rio Earth Summit 1992, and especially since the International Year of Mountains and its final conference in Bishkek in 2002 (Messerli and Bernbaum 2004). Moreover, fragile mountain ecosystems have begun to play a more and more important role, as most sensitive indicators, in global environmental change programmes. This trend and its significance are represented in Figure 7, which also shows the increasing complexity of the processes and again the need for regional knowledge centres (see Figure 1). In relation to this, it is of interest to quote the United Nations Environment Programme (UNEP) Evaluation Report about barriers and best practices in the integrated management of mountain ecosystems (UNEP 2003):

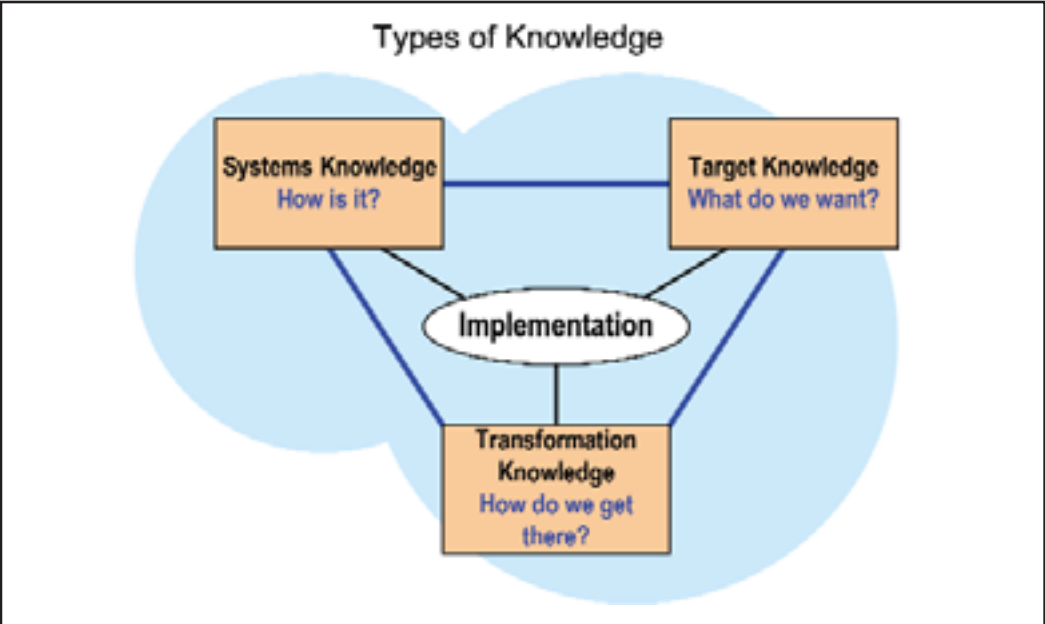
“The activities undertaken by ICIMOD with the ongoing MENRIS programme have made a substantial contribution both in terms of advancing technology and improving the way in which geographical information is managed, enhanced, accessed and leveraged for sustainable development in the Hindu Kush-Himalayan region.”



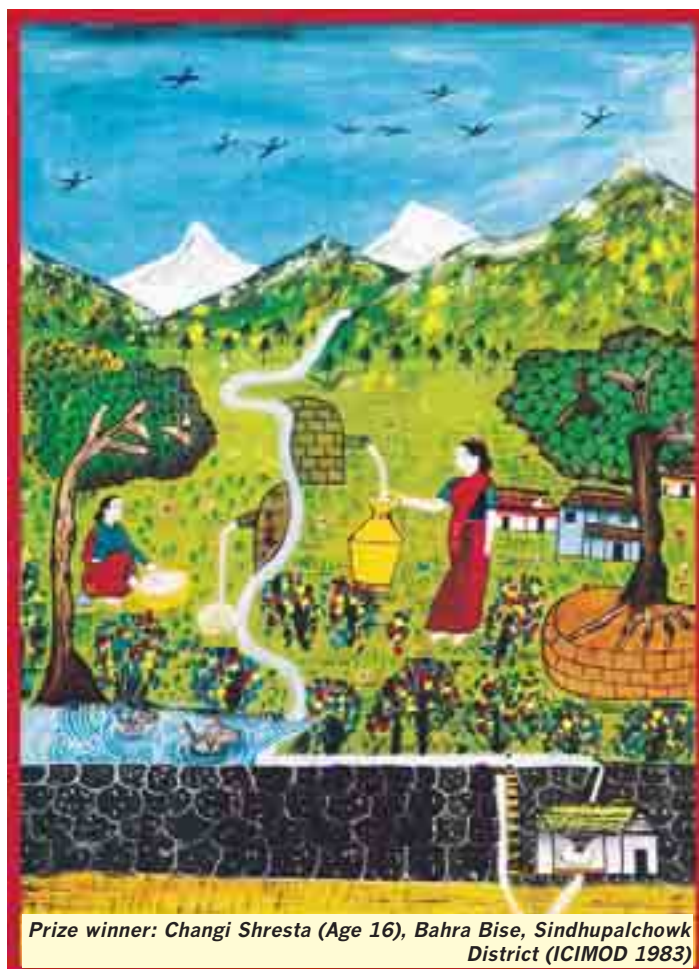
**Figure 7: Elements of an integrated approach to help understanding of the driving forces in natural and human systems from the local to the global level in a time of rapidly growing processes of ‘globalisation’ and ‘global change’**  
(Source: Messerli 2004)

Looking back, and forward, the three main types of knowledge remain the same (Figure 8). ‘Systems knowledge’ refers to the current state of knowledge with its structures and processes, variability, and interactions. It should include natural and social factors and processes and their connections. ‘Target knowledge’ is the knowledge concerning what may be, or what should be. It requires an evaluation of the current situation, prognoses, and scenarios, providing critical levels or thresholds, guiding ideas, ethical boundaries, conditions, visions, and so on. Science must stimulate discussions on the values and targets of future development. ‘Transformation knowledge’ is knowledge on how to shape and implement the transition from the existing to the target situation (CASS and ProClim 1997). All together, future environmental and sustainability research needs to place greater emphasis on ‘target’ and ‘transformation knowledge’. For ICIMOD, this again means a mobilisation of the best talents in the region, as well as internationally, either by engagement, an exchange of staff, or through visiting fellowships.

Finally, to help us to rethink the past for the future, Figure 9 shows a wonderful painting by a 16 year-old girl who was the prize winner in a school competition held for the inauguration of ICIMOD in 1983. It is an exciting child’s-eye view of her dream of how the natural and human mountain environment should look in future in the 21<sup>st</sup> century, or perhaps even on the 21<sup>st</sup> anniversary of ICIMOD. This girl was 16 years old in 1983. Now she is a 37 year old woman. Where is she today and was her dream realised? If not, why not? She should make a new painting of her current situation. It would be like a mirror for us to see what she wanted 21 years ago and what her reality is now. Perhaps she could even explain to us, why her dreams could not be realised. Her story could be a unique stimulus for Research, Development and Cooperation to Secure Sustainable Livelihoods in the Hindu Kush-Himalayas!



**Figure 8: From the past to the future: the contribution of science to sustainability is based upon three types of knowledge** (Source; CASS and ProClim 1997)



**Figure 9: Prize winning entry in a painting competition for schoolchildren from all over Nepal held by ICIMOD for its Inauguration Ceremony in 1983**

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Session I

# Securing the Mountain Environment

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*Chair: Mr Egbert Pelinck*



# **Keynote Paper – Securing the Mountain Environment: Advanced Technologies for Mountain Environment Research and Management**

*Dr Massimo Antoninetti, Ev-K<sup>2</sup>-CNR Committee*

## **Introduction**

It has been widely accepted that mountain regions are at risk of severe degradation. This is due to their sensitivity to global changes and a growing unsustainable exploitation of natural resources including poorly regulated tourism, unsound agricultural practices like overgrazing, the relentless harvesting of fuelwood, and the mismanagement of water resources. A sound scientific base is required in order to ensure good management practices, from local protected areas to central policy-level decision making. When it comes to the management of mountain regions, this is rarely or only partially available, especially in developing countries.

The extent of the impact of this reality is not fully appreciated. This is primarily due to the cultural and biophysical complexity of mountain regions and the fact that, to date, the scientific theoretical basis has not been sufficiently adapted to such extreme environments. The environmental constraints of mountain terrain, in many cases greatly hampers or prevents the application of data collection methodologies extensively used at low altitudes. Furthermore, the sharing of data and information is, in some cases, at such a basic level, or is the result of such isolated, intensive investigations, that it runs the risk of turning into misinformation.

Taking the Khumbu Valley as a case in point, we can examine its environmental degradation due to population pressure and infrastructural demands linked to growing tourism. This is coupled with a natural setting that tends towards problems such as accelerated soil erosion and sensitivity to climate variations as evidenced by the fragile mountain ecosystems. The need for multi-disciplinary coordinated monitoring and improvement schemes has become urgent if we aim to achieve truly sustainable development and guarantee genuine environmental conservation.

The Italian Ev-K<sup>2</sup>-CNR Project is an example of the application of advanced technologies to mountain research that aims to contribute to sustainable management processes. Our Pyramid Laboratory-Observatory at 5050 masl, near Mount Everest Base Camp in the Khumbu Valley, provides a unique and exceptionally equipped logistical base with a self-sufficient renewable energy system and a fully equipped scientific laboratory. For nearly 15 years, with the constant support of our National Research Council and our Nepali partners at the Royal Nepal Academy of Science and Technology, it has been possible for hundreds of researchers from around the world to study and monitor the mountainous environment of the Khumbu Valley year round.

While we are not suggesting that laboratories be built in all high mountain valleys, the application of advanced technologies can significantly help to reduce, or even remove,

the objective difficulties that mountains pose for scientists, decision makers, and communities who must face and solve the environmental problems related to a more humane and sustainable development of the world's highlands.

## **Fields of action for advanced technologies**

Modern technologies are being consistently conceived and produced so as to be more easily used in nearly any situation. However, researchers should be aware that instruments may need periods of testing, or special adaptations, to work in extreme conditions of low atmospheric pressure (around 550 Pa at the Pyramid), high solar radiation, and a daily temperature oscillation of up to 30°C a day.

Nonetheless, several innovative research technologies have been successfully tested and applied to multi-disciplinary environmental research in the Khumbu region. I will discuss in particular the following technologies:

- global positioning systems (GPS)
- automatic weather stations
- long-range pollution transport monitoring systems
- geographic information systems (GIS) and multi-source/multi-format data handling and sharing
- clean technologies and renewable energy systems

## **Global Positioning Systems (GPS)**

Since having 'gone public' some years ago, the applicability of GPS technology to science has been demonstrated repeatedly. It is particularly appreciated in mountainous terrain, be it to precisely determine the coordinates of natural hazards, or to geo-reference field data.

One example of its application is in the field of glaciology. Continuous monitoring of glaciers makes an important contribution to our understanding of global changes and the impact of the greenhouse effect. Yet conventional surveying approaches are frequently hindered by poor visibility, steep terrain, and bad weather, and also by the inadequacy of glacier maps based on aerial photographs that make the plotting of contours difficult due to the featureless nature of large areas covered by snow.

Our years of GPS-aided research on the glaciers of the Everest region, such as the Changri Nup, have confirmed a constant retreat of the uncovered glacier terminus and a significant increase in the size of small seasonal lakes. The monitoring and documenting of deformations with millimetric precision is made possible using GPS measurements in real time kinetics by connecting portable GPS instruments to a master station at the Pyramid laboratory using an innovative technique via a cellular satellite telephone and by taking static measurements. These activities have been integrated with repeated observations made using laser scanning technology able to trace a three-dimensional outline of the entire glacier terminus so as to monitor evolutions from year to year.



It is worth noting here another key application of technology, well known to our colleagues at ICIMOD and UNEP-Asia, the mitigation and prevention of glacial lake outburst floods (or GLOFs). GPS is also being successfully employed to study the risks of outburst floods on the Imja Tcho glacier lake. Recently, a seven-metre anomalous cave-in of the debris covering, caused by a rapid melt of the ice below, was measured on this glacial lake. Thanks to ICIMOD and UNEP's work on another at-risk glacial lake, the Tsho Rolpa, a gated canal has been constructed to lower the water level and an early warning and sensing system installed in the lake and along the downstream valley.

Other applications of GPS technology deal with the acquisition of gravimetric and geological data in the area, considered one of the most seismically active regions in the world. GPS technologies have also assumed an important role in the saga of the measurement of Everest's altitude, which is influenced by fluctuations in the depth of snow on the summit. This past summer the debate was finally put to rest when an Italian-Tibetan-Nepali team used an innovative instrument formed by a ground penetrating radar and a GPS receiver system (antenna and recorder) to calculate the actual rock height of Everest. Proving science is not an end in itself, this 'GPS/Georadar' will now be adapted for use by Alpine rescue squads in locating avalanche victims.

## **Automatic weather stations**

Only since 1994, when the first automatic weather station with bi-hourly continuous data collection became operative at the Pyramid site, have regular climate measurements at high altitudes (5000 masl) been possible. This monitoring process has since become known for the exceptional regularity of its measurements. The Pyramid automatic weather station marked the starting point of Ev-K<sup>2</sup>-CNR's wider involvement in international climate and meteorological research. A landmark moment in this evolution was the inclusion of the Pyramid Meteor-Group in the World Meteorological Organization (WMO) Coordinated Enhanced Observing Period (CEOP)/Tibet Project as of 2002.

Thanks to its unique characteristics and potential for providing insights into the interaction between the Asian monsoon and the Himalayan barrier, the Pyramid automatic weather station has been accredited as the Coordinated Enhanced Observing Record Himalayan reference site. Additional stations have since been installed along the Khumbu Valley at 2700, 3500, 4250, and 5050m, resulting in the only vertical high altitude weather monitoring network. These solar-powered automatic weather stations are reachable on foot and continuously monitored by local staff. They are among the most accurate and efficient in the Himalayan range, recording World Meteorological Organization standard data on digital loggers with mass memory on memory cards. The network has been expanded recently to include an additional station at Urdukas, along the Baltoro glacier in Pakistan near K<sup>2</sup> base camp.

## Long-range pollution transport monitoring systems

The AWSs in the Khumbu Valley form the base of Ev-K<sup>2</sup>-CNR's multidisciplinary climate and atmospheric research project 'Stations at High Altitude for Research on the Environment in Asia (SHARE-Asia)'. This project foresees the expansion of the monitoring network throughout the Hindu Kush-Karakoram-Himalayan region and aims to use the data collected to perform analyses on:

- ocean, soil, and atmospheric interaction mechanisms governing the monsoon climate system;
- the distribution and transportation of pollutants related to the atmospheric brown cloud; and
- mechanisms determining the presence of pollutant depositions found in air, snow, and lake sediment samples at high altitude.

As stipulated in our preliminary agreement with UNEP-Asia, the primary contribution of these installations will be to increase our understanding of the interactions between the vast extent of haze hovering over most of Asia, known as the atmospheric brown cloud, and the major Asian mountain chains. The role of the mountains has yet to be fully comprehended, both in terms of their function as a circulation barrier and as a potential collection point for the deposition of particulate components, consisting of sulphates, nitrates, organics, black carbon, and fly ash, among other substances, which can be transported far from their source.

The potential global consequences of this haze include climate change and impacts on ecosystems, the water cycle, agriculture, and human health. The network of ground-based monitoring stations that UNEP plans to establish throughout Asia, to study the composition and seasonal pattern of the haze, already include monitoring sites run by ICIMOD in the Kathmandu Valley and lower hills. Ev-K<sup>2</sup>-CNR's input will be to capture traces of aerosols and particulates accumulating at sensitive high altitude automatic weather station sites in Nepal and Pakistan, allowing climatic, atmospheric chemical, and ecological measurements to be carried out above the cloud's level of maximum density (3000m). This partnership is an excellent example of how quality research, promoted in cooperation with regional intergovernmental organisations, can directly influence capacity building efforts and bring scientific results to the notice of governments.

Understanding the complex relationship between climate, meteorology, environment, and human activities also implies explaining the mechanisms that lead to the discovery of traces of pollutants, even in these remote areas. Thanks to the support of the Pyramid facilities and its logistical expertise in operating in high mountains, Ev-K<sup>2</sup>-CNR has been able to combine periodic samplings of glacial ice, of surface snow up to 7000m, and of water from about 35 Khumbu Valley lakes to study the effect of pollutant loads in Himalayan precipitation and indirectly assess the quality of the air above while identifying the possible origins of the pollution. Besides identifying elements such as lead, cadmium, copper, and zinc, these studies have focused on finding traces of heavy metals, like those from the platinum group, coming from vehicle catalytic converters thousands of miles away.

Radio analytical and spectrochemical techniques have also been applied in studies on atmospheric pollution processes in which analyses of trace elements (V, Mn, Cr, As, Co, Zn, Fe, Se, Sb, Cs, Sc, La, and Br) were carried out in the Everest region, using lichens as biomonitors of trace metals. A sampling campaign for airborne particulate matter collection at the Pyramid Laboratory was also carried out later; samples of total suspended particulate matter (TSP) and different particle size fractions (PM<sub>10</sub> and PM<sub>2.5</sub>) were collected.

## **Geographic information systems (GIS) and multi-source/ multi-format data handling and sharing**

Mountain environmental changes and the effect of human activity on mountain environments are often only directly and immediately observable by consulting diverse sources of data and information. The study of such information requires specific tools to analyse variations occurring over time. The increasing availability of huge repositories of data, accumulated at different times and with diverse techniques and instruments, opens up new research fields of time-varying process analysis. This is paramount for a wide spectrum of applications related to impact assessment and decision making for the management of natural resources and the study of climatic variations; fields of great significance for sustainable development.

Due to the amount of data, naive management and analysis are no longer acceptable. New elaboration procedures must be identified and validated and supported by software systems capable of efficiently storing and retrieving information based on both spatial and temporal features. Traditional GIS often include database facilities and sometimes provide the means to represent temporal information and dynamics somehow associated with the spatial framework, which emphasise static representations of reality, but these may not be enough.

In response to this new technological challenge, Ev-K<sup>2</sup>-CNR, The World Conservation Union (IUCN), ICIMOD, and Cooperazione e Sviluppo Onlus (CESVI) (an Italian NGO) have joined in a World Summit on Sustainable Development (WSSD) partnership initiative, with the support of the Italian Ministry of Foreign Affairs, to develop a decision support system (DSS) for the Hindu Kush-Karakoram-Himalayan region. A DSS can be defined as a computer-based system that integrates data sources with modelling and analytical tools; facilitates the development, analysis, and ranking of alternatives; assists in the management of uncertainty; and enhances overall problem comprehension. Our in-progress DSS, to be piloted in the Sagarmatha National Park in Nepal and replicated for the Central Karakoram National Park in Pakistan, will include geo-referenced and dynamic scientific data forming a base for predictive models that aid in decision making on natural resource management. The data stored in GIS-based systems will be rendered consultable through formal methodologies (rules), employing specific logical and computational modules (functions). The system will be completed by input, in terms of thorough interpretive knowledge, from multidisciplinary scientific experts, and the involvement of local actors and decision makers, supported by institutional capacity building and technical scientific training components.

## **Clean technologies and renewable energy systems**

Waste management and the production of heat, cooking fuel, and electric energy are some of the most important issues that need to be addressed to reduce human impact on the environment in widely populated and visited remote areas. Ev-K<sup>2</sup>-CNR has tested and successfully employed alternative energy systems, like photovoltaic and mini-hydroelectric systems, at surprising levels of efficiency even under the most extreme conditions. These experiences can be, and are being, replicated in similar mountain environments.

We are now also applying ISO 14001-standard methodology in developing waste management protocols for the Pyramid Laboratory and for large scale climbing expeditions. The most common waste management solution in mountain areas is transportation to the nearest urban centre for disposal. In the case of the Khumbu Valley, this is Kathmandu. This involves cost and pollution risks that are not sustainable. Alternative solutions are thus being sought which could lower the volume and weight of waste transported down valley, such as the use of a mini-incinerator recently developed for use at K2 Base Camp. This approach, combined with an environmental code for expeditions and trekkers, as well as awareness raising for local communities and workers, will help reduce the quantity of non-biodegradable waste and facilitate the proper management and disposal of what is produced.

## **Conclusion**

Modern advanced technologies are greatly improving our knowledge of the complex interactions between the environment and human activities, even in the most remote areas of the world. The progress of micro-technologies means that compact, portable instruments can be developed while also improving performance and reliability. Satellite observation systems, namely optical, infrared, and microwave imageries, offer us a unique opportunity to trace phenomena in the atmosphere, or on Earth, back to their origins. News, information, and data can reach everyone in real time through the existing telecommunications network. However, these technological opportunities must foresee the involvement of experts to avoid the misinterpretation of data and resulting errors, while reaching out to as wide a user community as possible, including those who may seem unrelated or often remain excluded (i.e., local stakeholders and communities).

In the case of mountain regions, especially in developing countries, this entails appropriate scientific training for local research institutions and capacity building for local stakeholders. For this, we are grateful to organisations like ICIMOD. Over the past 20 years, ICIMOD has consolidated its leading role as a centre dedicated to the promotion of balanced environmental and economic development of transboundary mountain ecosystems. Only multidisciplinary expertise like ICIMOD's can successfully contribute to avoiding the risks posed by the inappropriate adoption and use of advanced technologies, while ensuring that their benefits are taken advantage of for the maximum common good.

# Panel Topic – Impacts of Global Warming and Climate Change on Mountain Ecosystems<sup>1</sup>

*Mr R Rajamani, former Secretary, Government of India, Ministry of Environment and Forests*

## Introduction

A caution may be in order at the beginning that this does not claim to be a well-researched scientific paper. The author has the disadvantage of not having full access to material databases, and also a personal background of only some involvement in policy formulation in the environmental field some years back; but also the dubious advantage of a deep interest in mountain ecosystems and some exposure, during various positions held in the civil service, to facets of mountain ecosystems. These advantages lend themselves to a holistic analysis and identification of gap areas in scientific thinking. On that note, I will first look at the nature of, and role of, mountain ecosystems (which include geographical elevations of 1000 metres and above).

Mountains provide over 60% of the fresh water resources of the world. This is partly through the conservation of rainwater in different forms – in vegetation, in deep rock formations, in internal aquifers that discharge into springs, and so on. Many rivers and streams have their origins in the hills and mountains of the world. Waterfalls are the product of such ecosystems.

These ecosystems harbour nearly half of the biodiversity hotspots in the world. This estimate is based on the inventorying of the flora and fauna done so far and has yet to cover so many life forms as yet unstudied or researched. Mountain ecosystems are fragile and subject to geological and other factors affecting their composition, structure, slopes, snow, soil, and vegetation cover. There are some mountain ecosystems in the world which have yet to stabilise after tectonic, volcanic, and other natural changes. This adds to their instability and makes them more vulnerable to climate change than other ecosystems.

Mountains are inhabited by many poor people. Nearly 80% of mountain people live below the poverty line and often have to depend on depleting natural bounty in the mountains, or on out migration. They have to resort to making changes in the mountain ecosystems in search of a livelihood. This includes activities such as building, grazing, and farming, which deplete the natural resources in the mountains including the soil and vegetation cover, which also conserves water. Such changes are compounded by natural phenomena like blizzards, avalanches, heavy snowfalls, and intense precipitation of rain. These manmade changes set off chain reactions leading to greater natural hazards like landslides.

Against this background, it may be useful to recapitulate the special characteristics that set mountain ecosystems apart from other ecosystems.

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<sup>1</sup> Note: the author is grateful to ICIMOD, GBPHIED, and EPTRI for their help in preparing this paper.

## **Special characteristics**

As mentioned above, mountains are fragile. They are storehouses of fresh water. Their biodiversity is often unique, leading to the description of some mountain areas as biodiversity 'hotspots'. Many species of flora and fauna are endemic or peculiar to mountain ecosystems. These species have various values as medicine, food, and for nutrition, which are distinct, based as they are on local features like well drained soils or temperate climate. The high plant diversity in mountain ecosystems adds to their resiliency and even acts as a cushion against natural events like landslides. The natural resources of the mountains include rich forests (which often act as sponges for water), herbs, minerals, and also the valuable germplasm of cultivars, the product of traditional farming systems, which are organic and conservation oriented. Of the 20 plant species that supply 80% of the world's food, six are found in the mountains.

The equable temperature and climate of the mountains contrasts with the tropical or near tropical conditions of the plains, especially in latitudes near the equator. This attracts tourists. In countries like India, locations in mountain areas of sacred sites that are venerated by people (often associated with sources of water or special flora or fauna) attract more tourists.

Mountain people do suffer from poverty and their health is affected by malnutrition and inadequate insulation from the vagaries of nature. However, they are rich in culture and this has spin offs, not only for religious lore and spiritual themes, but also in the production of beautiful handicrafts and special agricultural and horticultural produce. The ethnic knowledge that they possess in relation to herbal cures and the special terrain of their surroundings is such that it opens up vistas in health, mountaineering, and more.

## **Impacts of global warming**

Each one of the above characteristics can be affected by global warming and climate change. The impact of global warming and climate change will not only be on water resources, like glaciers or glacial lakes, but also on soil, vegetation, sustainable farming, industry, and tourism. A combination of these various impacts can aggravate both the life and livelihood securities of mountain people.

## **Glaciers and water**

Many organisations like ICIMOD are concerned about the recession of glaciers due to accelerated global warming. In the normal course, these glaciers thin out in the summer, feeding lakes, which in turn feed the rivers. The glaciers are renewed by snowfall and low temperatures in winter. However, if there is a rise in temperature, due to factors like global warming, glaciers can melt fast and flow rapidly into glacial lakes that form behind the newly exposed terminal moraines. Such lakes can burst, leading to a phenomenon called glacial lake outburst flood – with ominous consequences for the terrain below.

An example of the retreat of glaciers is the Gangotri Glacier in the Indian Himalayas. This glacier seems to be retreating faster in recent times. Between 1780 and 1900 (a little over 100 years), it receded by 0.3 km, but in the 100 years between 1900 and 2000, it receded by over one km!

A study of 5000 glaciers spread over 43,000 sq.km of the Indian Himalayas, estimated that glaciers are retreating at an average rate of 18-20 metres per year<sup>2</sup>. This has led to widespread discussions on whether or not this is another phase of glacial history that is likely to be reversed, or if it is likely to worsen, and if so what the consequences will be?

A study of the big Gandhisagar Lake near Chaurabari Glacier shows that its major contribution of water is not directly from glacier melt, but from snow melt from the valley sides. Such findings and studies do pose questions as to whether or not there is a direct relationship between global or local warming and snow melt. The answers to these questions are important in view of the long-term consequences that such recession and melts can have for mountains and floodplains in terms of loss of productivity and other impacts on regional economies.

In the context of mountain water resources and the impact of changes on their regime, it may be useful to ponder whether or not it suffices to concentrate only on disaster mitigation studies of the type done by ICIMOD and other institutions, or if we should be looking at basic and controllable causes, whether local or global, in a preventative mode. Such speculation and findings may have to be extended to the other special characteristics of mountain ecosystems like biological diversity.

## Biodiversity

The Conference of Parties has selected mountain biodiversity as one of the major themes for in-depth consideration under the Convention on Biological Diversity. The follow-up studies or actions will cover:

- activities to facilitate the maintenance, protection, and conservation of the existing level of endemic species, with a focus on narrowly distributed taxa;
- programmes to restore degraded mountain ecosystems and biodiversity to enhance the capacity of mountains to cope with climate change or recover from its negative impacts by establishing corridors to enable the vertical migration of species;
- key research on the role and importance of mountain biodiversity; and
- the identification of factors responsible for the retreat of glaciers and measures to minimise the impact on biodiversity.

These studies are no doubt very important. Changes in endemism can occur if the upward migration of life zones takes place as a consequence of global warming. However, mitigating or preventive measures should also be related to the direct cause, whether it is global warming isolated from other causes like anthropogenic pressures

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<sup>2</sup> Naithani, A.K.; Nainwal, H. C.; Sati, K. K.; Prasad C. (2001) Geomorphological evidences of retreat of the Gangotri glacier and its characteristics. In *Current Science*, 80: 87-94



and local phenomena, or these other causes themselves. If these other causes remain, mitigating measures against global warming alone cannot help. In addition, the facts must be firmly established, based on time series data, whether relating to glacial recession or the upward migration of species.

## **The nature of studies undertaken so far**

Some examples are given of the nature of studies undertaken by some of the institutions covering the Hindu Kush-Himalayan region. The GB Pant Himalayan Institute of Environment and Development, at Kosi Katarmal in Uttaranchal, depicts in its Annual Report for 2002/03 that research and development have been directed more towards aspects of land and water resource management in the Himalayan mountain ecosystem. Topics connected with conservation or biological diversity also figure prominently in the studies. Most of these studies are correctly linked to improving the living conditions of marginalised or poor groups in the mountains, or to the study of degradation in watersheds. In the Institute, biodiversity studies are undertaken on habitat fragmentation in protected areas and ecologically sensitive habitats, focusing on location specific issues of a short-term nature. Long-term studies relate to bio-resource inventorying, conservation with participation of the people, and studies of disturbances in forests due mostly to anthropogenic factors like habitat fragmentation. No specific study was noticed linked to global warming.

In ICIMOD, some activities, such as the People and Resource Dynamics Project (PARDYP) do address mitigation concerns in relation to natural disasters. However, this is not linked to the effects of temperature variation, local or global. There is some expectation that this would be dealt with in the integrated programme on Water, Hazards and Environmental Management (WHEM). One of the initiatives under the latter is to develop an understanding of the linkages between glaciers, glacial lakes, and climate change. However, it is not clear if this will include a deep study of the relationship between global warming data and data on the physical phenomena affected.

The effects of global warming on the other special characteristics of mountain ecosystems – like cultivars, climate, tourism, and traditional knowledge systems – and through these characteristics on poverty and health, are not taken up as major programmes by most institutions. In India, there are hardly any programmes studying the effects of climate change on mountain/hill ecosystems like the Western Ghats, the Eastern Ghats, or the Aravallis.

## **Recommendations**

Taking all of the above into account, the following recommendations are made in relation to possible future areas of study and for action plans in mountain ecosystems in the context of climate change.

- Specific projects should be undertaken, drawing on studies of the rise in temperature and/or humidity in mountain ecosystems. Such studies must use time series data, which is available from global and local level meteorological institutions.

- In parallel, studies should be undertaken to isolate the effects of other causes, like anthropogenic pressures and heat island effects. Some of these may arise from deforestation, excessive building activity, or conversion of water bodies for non-water uses.
- The direct impact of global warming on all of the special characteristics of mountain ecosystems should be researched.
- As studies get underway, interim suggestions for the prevention/mitigation of likely damage should be given to planners, policy makers, implementers, and civil society on a precautionary basis.
- In some cases, studies on indicator species with a focus on endemism may be undertaken, relating them to global warming.
- ICIMOD must persuade the Global Environment Fund and the Secretariats on the Convention on Biodiversity and Climate Change to fund such projects as a priority, as mountain ecosystems suffer from greater degradation, human misery, and out migration, which in turn affect other ecosystems like those of the floodplains and their peoples.
- ICIMOD can undertake studies on Indian mountain ecosystems in collaboration with institutions like the GB Pant Himalayan Institute of Environment and Development (Himalayas), the Environment Protection Training and Research Institute, Hyderabad-Eastern Ghats, and the Centre for Science and Environment, Indian Institute of Sciences, Bangalore-Western Ghats.

## **Panel Topic – Environment Services and Upstream-Downstream Relationships in Pakistan**

*Dr M Sharif Zia, CSO/Incharge, Natural Resources Division, Pakistan Agricultural Research Council (in association with Dr A.W. Jasra, Director and Dr I. Ahmad, Deputy Director, NRD, PARC)*

### **Introduction**

The northern mountains of Pakistan in the Hindu-Kush Himalayas (HKH) are mainly comprised of the Northern Areas, Malakand division, Hazara division, and Azad Jammu and Kashmir. These mountains cover an area of 115,340 sq.km. The region is characterised by steeply dissected mountain slopes with strong higher relief. There is great variation in regional and altitudinal rainfall from arid to humid; in seasonality from monsoon to Mediterranean; in temperature from subtropical in the valley to arctic at high altitude (cool, cold, very cold); and in altitudinal range from less than 1000m to more than 8600m. The mountain slopes support mainly unstable, excessively drained, shallow to moderately deep, gravelly loam soils on bed rock. Without vegetation cover and with high rainfall erosivity and soil erodibility in the humid monsoonal zone, these soils are subject to severe sheet, rill, and gully erosion (GOP 2001).

The northern mountains provide the most important catchments for two vital dams, Tarbela and Mangla. Of the total 202,062 sq.km catchment area, about 74,793 sq.km

lies within Pakistan. These catchments are drained by the Indus and Jhelum rivers and numerous tributaries discharging about 139 MAF [million acre feet, ed] of water. These mountain areas support a wide range of agricultural crops, fruit trees, forests, medicinal plants, and rangelands, and play a key role in the socioeconomic uplift of the people living in the area (GOP 2001). Mountainous and sub-mountainous regions in the HKH part of Pakistan are potential sources of natural resources for the country. The sustainability of this belt is threatened by overgrazing and the destruction of forests to meet the fuelwood and timber requirements of its inhabitants. In addition, extensive and intensive cultivation to grow more food for the increasing population, together with expansion of cultivation to marginal steep sloping lands, is leading to severe soil erosion, landslides, siltation, and the degradation of watersheds. Increases in the upstream population are resulting in further fragmentation of already small holdings, which may not be able to provide a sustainable livelihood for the upstream people. This in turn causes migration to downstream areas, where upstream people are employed in industry and other non-farming enterprises. The pressure of urbanisation causes a direct loss of productive agricultural land, and problems of soil and water pollution threaten downstream agricultural productivity (Figure 1). Land degradation, desertification, and increasing poverty are the main issues for these areas. The concept of environmental services, in the context of the upstream and downstream scenario, is not very clearly understood in Pakistan. In addition, there is no legal mechanism for payment for environmental services. It is believed that all of these issues are common in countries in the HKH region. This paper addresses all of these important issues so that common strategies can be formulated to reduce land degradation and poverty in all countries in the region.

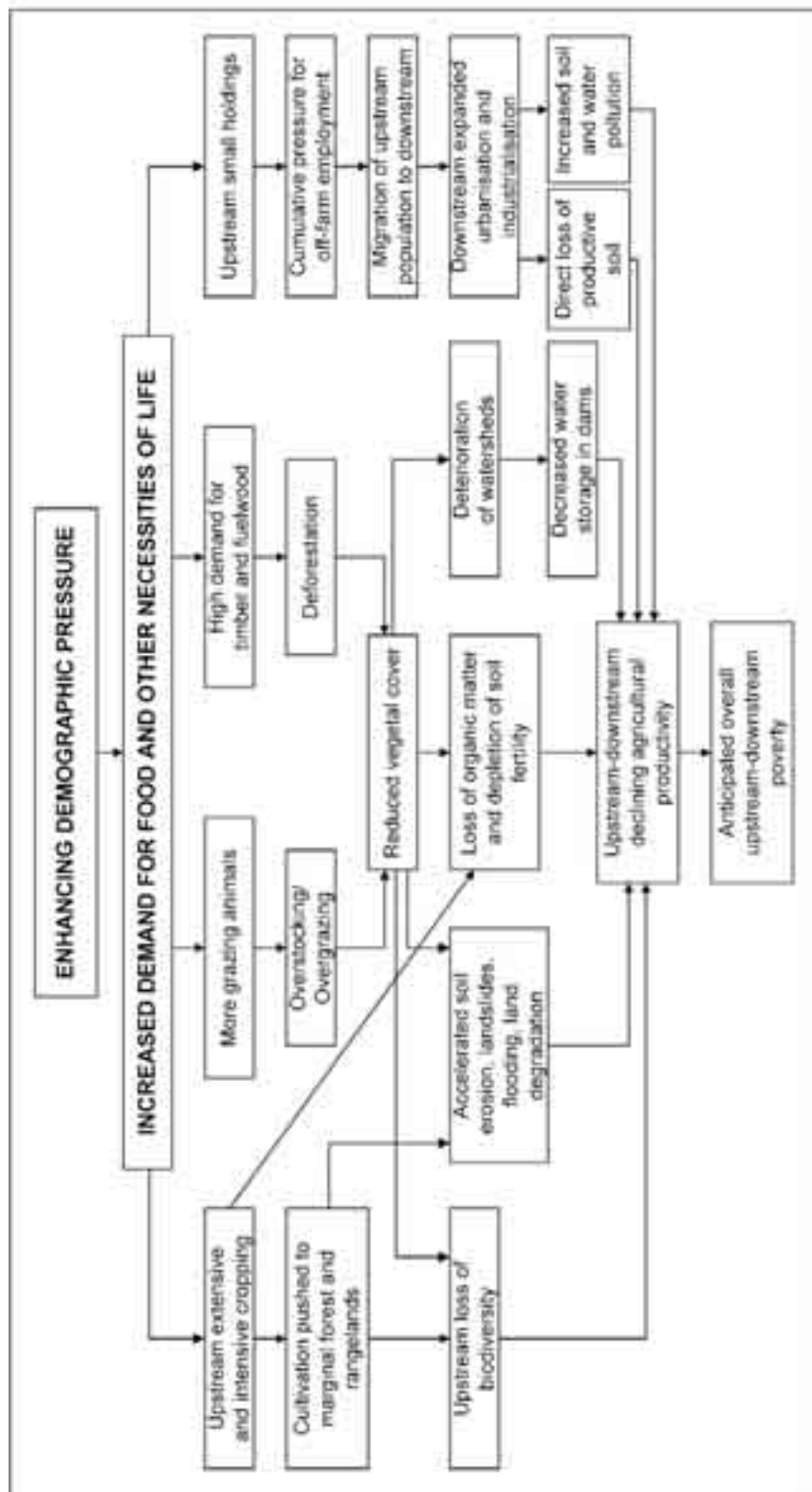
## **Environmental land degradation in mountain regions**

### **Land degradation and desertification**

Mountain ecosystems harbour a wide range of significant natural resources and play an important role in the ecology and economic processes of the earth. As upstream mountain populations and accessibility to mountain areas have increased, mountain resources and people have moved downstream, and environmental degradation has gone upstream.

There is a high incidence of environmental degradation in mountain areas due to their extreme fragility. Mountain ecosystems are characterised by factors such as geomorphic energy, steepness, isolation, and low temperatures, which cause vegetal growth and soil formation to occur very slowly. Soils are usually thin, young, and highly erodible. Under these conditions, farming in marginal mountain areas can easily cause environmental imbalances. Once eroded, mountain areas may need hundreds of years to recover.

Deforestation, landslides, land degradation, desertification, and glacial lake outburst flooding are key environmental issues. Mountain areas are particularly susceptible to natural hazards mainly in the form of earth surface processes such as avalanches, rock falls, debris flow, volcanic mud flow, glacial lake outburst floods, and other types of



**Figure 1: Upstream-downstream relationships with reference to population pressure, soil degradation and poverty in the HKH region** (Source; Zia 2004)

floods. The disaster database of the Office of US Foreign Disaster Assistance/Centre for Research on the Epidemiology of Disasters (OFDA/CRED) recorded a total of 2557 hazards worldwide between 1991 and 2000 (Iyengararasan et al. 2002). Losses from natural hazards in mountain areas have been increasing as a result of the over exploitation of natural resources, deforestation, and the construction of infrastructure such as buildings, roads, irrigation canals, and dams. Climate influences the weathering process, erosion, sediment transportation, and hydrological conditions. Climate also affects the type, quality, quantity, and stability of vegetal cover, and therefore biodiversity. Mountain systems are particularly sensitive to climate changes. The major triggering factors for landslides and debris flows are heavy rainstorms, snowmelt run off, and the human modification of mountain slopes.

Rising temperature trends in the Himalayas and their vicinity between 1977 and 1994 (Shrestha et al. 1999), resulted in glacier shrinkage, thawing of permafrost, late freezes, and early break-up of ice on rivers and lakes, the poleward and altitudinal shift of plants and animal species, the decline of some plant and wildlife populations, and earlier emergence of insects (IPCC 2001). A more general trend is that plant and animal species are expected to shift upstream.

Regional haze could have a potentially significant impact on the monsoon climate, water stress, agricultural productivity, and human health. The most direct effects include a significant reduction in the amount of solar radiation reaching the earth's surface, an increase (50-100%) in solar heating of the lower atmosphere, suppression of rainfall, a reduction in agricultural productivity, and adverse health effects. These will be of concern in both upstream mountain regions and downstream areas.

Aerosols directly alter the hydrological cycle by suppressing evaporation and rainfall. With respect to agricultural production, a decrease in the amount of solar radiation received by vegetation can impact on productivity, directly and indirectly, through induced changes in temperature and the hydrological cycle.

Mountains have been described as 'water towers' – the source of freshwater for billions of people around the world (Iyengararasan et al. 2002). Climate change, especially the rise in temperature, will result in the loss of water due to glacier shrinkage (IPCC 2001). The Himalayan glaciers are also melting at a rapid pace resulting in the formation of dangerous lakes.

Factors encouraging degradation in mountain areas include climatic variation and unsustainable human activities such as overcultivation, overgrazing, deforestation, and poor irrigation practices. The main unfavourable social, cultural, and political factors include low literacy rates, high female workloads, and lowland interests.

Increasing population trends (human and animals) will exert more pressure on forests and rangelands. With such increases in population, demand is growing for more cultivable land, fuelwood, timber, and fodder. As a result, soil degradation, particularly

in the form of landslides and soil erosion, is increasing at an alarming rate, resulting in anticipated reduced crop productivity (Zia 2004).

Desertification – a reduction in the ability of land to support vegetation leading to a vicious cycle of poor vegetation and poor soil – is caused by the complex interaction of physical, biological, political, social, cultural, and economic factors. Although desertification has become a global issue, it remains poorly understood. Available estimates of areas affected range from one-third to about a half of the world's land. Estimates of people affected range from one in six to one in three (Toulmin 2001). One common estimate is that desertification and land degradation affect almost 30% of the global land area and nearly 850 million people. The problem of desertification is becoming more and more serious each year. For example, the deserts of China are expanding each year by 2460 sq.km at a cost of US \$1.52 billion (Iyengararasan 2002).

### **Measures to reduce environmental degradation**

Environmental degradation can be controlled by controlling population growth, creating off-farm employment opportunities, and stopping deforestation and overgrazing by adopting best practices. A detailed account of best practices for the cold and dry zone of the HKH is given by Shaheen (1998). Deforestation can be controlled by stopping the expansion of crop cultivation on steep sloping lands; by reducing the use of wood for fuel by providing alternative energy sources; by the forestation of mountain areas and watersheds; and by growing horticultural plants and grass legume mixtures in these areas. Environmental degradation can only be reduced through the sustainable management of forests, watersheds, and rangelands with the involvement of local communities in development activities and in creating alternative opportunities for their sustenance. Illicit tree cutting, felling, and grazing have to be controlled at any cost. The cultivation of value-added shrubs, such as tea, would be more profitable in watersheds and mountains. Practices to counter the damage caused by overgrazing include reducing livestock numbers through increased market off-take, sterilisation, and stopping or controlling livestock movement by switching to stall feeding for meat and milk production. Introducing improved breeds and reducing losses from disease would allow farmers to maintain output levels with fewer animals.

## **Poverty in the Hindu Kush-Himalayas**

### **Poverty Scenario**

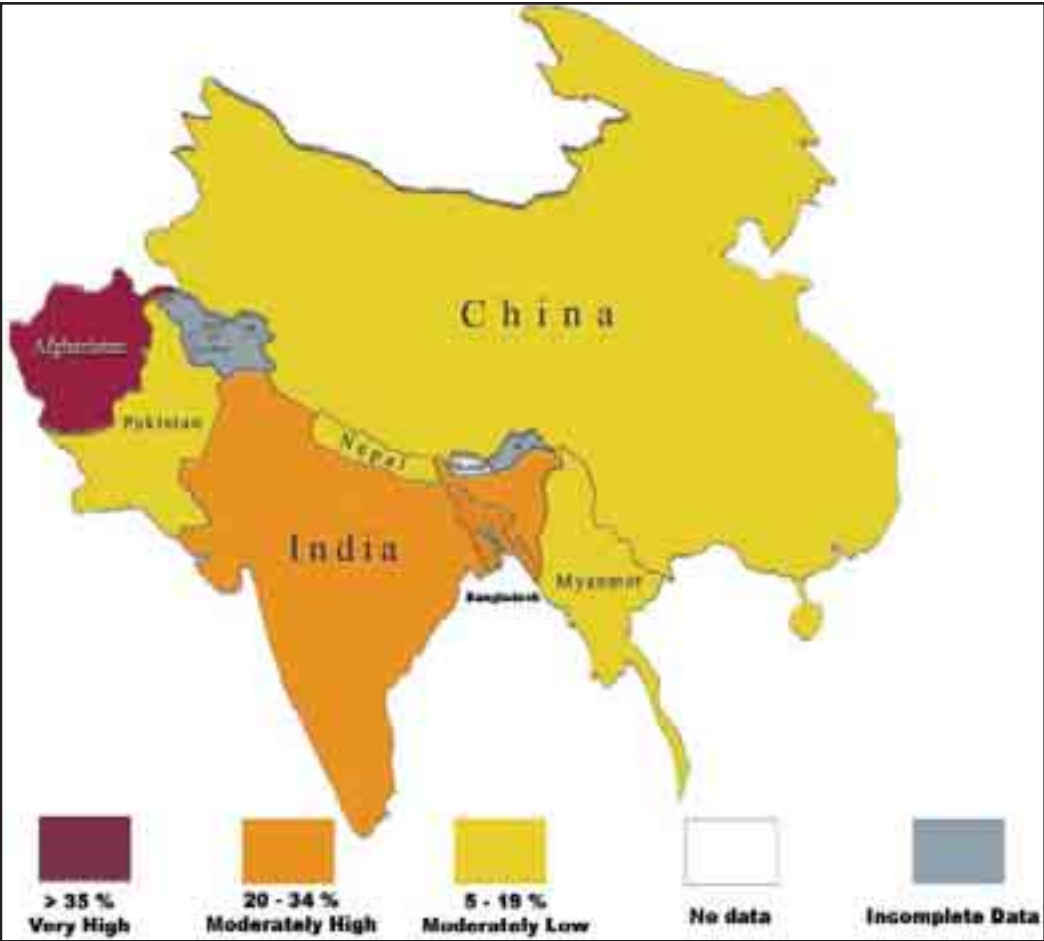
The overall poverty situation in the HKH countries presents a dismal picture. High population growth rates, increased population pressure on natural resources, relatively limited opportunities for occupational mobility, and imperative outmigration are prominent features of the ongoing scenario in the mountains. There is an equally important and more disturbing trend with respect to the indicators of human development. The relationship between population pressure and poverty is well explained by Zia (2004) in a flow diagram (Figure 1). In all the HKH countries, population is rising at a rapid pace and this is likely to aggravate the poverty situation. Using a poverty threshold of two dollars a day, which is no generous standard by any means, well over two-thirds of the people in Bangladesh, India, Nepal, and Pakistan live

in poverty (van der Liden 2004). As a result of poverty, many people sleep hungry. According to the FAO (2003) World Hunger Map, the situation is worst in Afghanistan, followed by India (Figure 2). However, the situation is comparatively better in Nepal and Pakistan. According to UNDP (1996), the upstream population is poorer than the downstream and people in rural areas are poorer than urban populations.

**Poverty alleviation**

Despite some major constraints in mountain areas, with the right policies and programmes, and with the participation of the people, poverty conditions can be substantially altered. Poverty eradication, however, cannot be achieved through one short effort; a common philosophy underlying many development projects. Poverty eradication needs continuous attention as communities move from one threshold to another.

Van der Liden (2004) reported a dramatic poverty reduction in the People’s Republic of China and southern countries. It was found that in cases of poverty reduction in Asia, an



**Figure 2: Hunger map of the HKH region** (Source: Extracted from World Hunger Map, FAO 2003)



increase in mean income was the single most important factor in reducing poverty. High rates of economic growth not only generate economic opportunities for the poor, but also increase the resources that governments have at their disposal to invest in the poor. In Bangladesh, India, Nepal, and Pakistan, the majority of the poor (more than 75%) live in rural areas, which depend on agriculture. Investment in rural roads, irrigation, rural electrification, and extension services would help considerably to improve their living standards.

Increasing the level of investment in basic education and health care is important to ensure that the poor participate meaningfully in their country's economic growth. The fate of the poor is not only linked to agriculture, but also to other sectors, through migration, trade, and remittances. The growth in these sectors, particularly in industry, has contributed less to poverty reduction in South Asia than it has in East and Southeast Asia. Policy makers must focus on generating high rates of sustainable growth, while ensuring that the benefits of this growth are spread over all sections of society. Pakistan will fully support ICIMOD's proposed strategy for poverty alleviation in mountain areas (ICIMOD 2000).

## **Upstream – downstream environmental services in Pakistan**

There is no authentic infrastructure in relation to upstream-downstream services available in Pakistan. The information compiled in this paper is the result of discussions among soil, agroforestry, and wildlife scientists.

### **Upstream services**

Over 90% of the Earth's fresh water is stored in ice, which together with seasonally stored snow, provides water on melting. Thus mountains are sources of fresh water which is used upstream and downstream for drinking, domestic use, fisheries, irrigation, hydro-electricity, industry, recreation, and transportation. Water is a major source of cheap power generation used by upstream and downstream populations for domestic and industrial uses.

In Pakistan, a 60% inventory of the Hindu Kush-Himalayan region has been completed in a collaborative project by PARC and ICIMOD. The project identified a total of 2808 glaciers covering a total glaciated area of about 7703 sq.km and with total ice reserves of about 1612 km<sup>3</sup> (WRRRI 2004).

Upstream regions are rich sources of biodiversity in the form of forests, rangelands, medicinal plants, and wild races containing genetic material for crops and fruit trees. Forests provide wood for fuel purposes upstream, and timber and timber products for household use, both upstream and downstream. Forests also provide a clean environment by consuming carbon dioxide. In addition, upstream regions are a rich source of minerals, gems, oil, and gas. These upstream areas also contain beautiful landscapes, which attract tourists from rich downstream communities (i.e., eco-tourism).

## **Downstream services**

Downstream areas are generally used for agricultural purposes and provide food in the form of wheat, rice, fruit, vegetables, sugar, milk, and cooking oil for upstream and downstream populations. Most industries are located in downstream areas. Almost all industrial products, such as cloth, medicines, fertilisers, pesticides, chemicals, detergents, electrical appliances, vehicles, and heavy machinery for road construction are provided to upstream people by downstream people.

The energy requirements of upstream people, in the form of gasoline, gas, petrol, diesel, kerosene, and candles are provided from downstream areas. Relief services in the case of a natural disaster are mainly extended by downstream areas to upstream areas. Most off-farm opportunities are extended to mountain inhabitants by downstream areas.

## **Payment for environmental services**

Sustainable water development and the mitigation of natural disasters in river basins, depend on large-scale measures to protect upstream water sources and soils in mountain areas. The environmental services provided by mountains are often only noticed when they are lost (e.g., when downstream floods are caused by upstream deforestation). Similarly, most of humanity depends upon the fresh water that originates in mountain watersheds.

To date, when making land use decisions, upstream people have generally not taken the value of environmental services (such as those provided by their forests and other permanent soil protecting vegetation) into account. This is because they do not normally receive any compensation for these services. Nor do they invest in conservation practices in relation to watersheds to benefit their downstream neighbours. The lack of attention to mountain watersheds has resulted in the dangerous acceleration of erosion in catchments at the source, and in the dwindling availability of water downstream. In Pakistan, there is a lack of effective, long-term, downstream-upstream environment maintenance and compensation agreements.

In Pakistan, the issue of payment for environmental services is complicated because of its technical, socioeconomic, and sociopolitical nature. There is no direct system for the accurate recording of payments for environmental services. Downstream people have no tradition of negotiating environmental safeguards with mountain people. Nor do they have any legal or economic instruments or social organisation models for such a system. However, there is strong evidence of a large number of indirect payments for environmental services to peoples living upstream. This is being managed by the Government of Pakistan from the taxes paid by downstream dwellers, an account of which is given below.

- The Government of Pakistan provides PRs.4 billion in the budget for annual development plans in upstream areas, compared to a meagre contribution from upstream resources.

- Royalties for building big dams in downstream areas (such as Mangla and Tarbela) are being paid to upstream people.
- Food items and other necessities of life are being provided to upstream areas at almost the same rates as paid downstream. The huge cost of transportation is subsidised.
- The development of infrastructure, including road networks, hospitals, schools, airports, and irrigation channels (khood system) is financed by the government.
- A large number of mega environment conservation projects have been started by the Government and by various NGOs as listed below.
  - Mountain Areas Conservancy Project
  - Environment Rehabilitation Projects for North West Frontier Province (NWFP) and Punjab
  - Northern Areas Conservation Strategy Support Project
  - Northern Areas Development Project (NADP)
  - Protected Areas Management Project
  - Khunjerab National Park Project
  - Agha Khan Development Network (AKDN) comprising the Agha Khan Rural Support Programme (AKRSP), Agha Khan Cultural Support Programme (AKCSP), Agha Khan Education Programme (AKEP), Agha Khan Health Programme, and others
- Promotion of eco-tourism to attract international and national tourists in the form of exhibitions and events like the annual Silk Route Festival, the Shandur Festival, and car rallies.
- Subsidised rates for electricity, gasoline, coal, and airfares.
- There is no government tax system in northern areas located in the HKH region.
- There is a quota for upstream dwellers in education and service institutions in downstream localities.

## **The impact of policy implementation**

### **Upstream benefits**

Even though there is no system in place for the payment of environmental services, the Government of Pakistan and NGOs are doing lot for upstream people. This has a great impact on the socioeconomic conditions in upstream communities. The following benefits are directly reaching upstream communities.

- Large-scale micro financing by financial institutions for various development schemes.
- Mostly local people from upstream areas are employed in infrastructure development and mega environment conservation projects. This has provided upstream dwellers with local off-farm employment opportunities.
- The development of infrastructure in upstream areas has resulted in better marketing activities, communication links, education, and health facilities for upstream communities.

- Environment conservation projects have improved biodiversity conservation and reduced environmental and land degradation.
- Improved protection against natural hazards and disasters
- Improved chances for sustainable livelihoods
- A reduction in poverty
- Eventually a better upstream standard of living

### **Downstream benefits**

Upstream environment conservation and reduced land degradation also have a positive impact on downstream people. Some of the benefits being harvested by downstream people are listed below.

- Improved water conservation in watersheds and increased storage in dams through reduced siltation
- More water availability for irrigation purposes and power generation
- Improved biodiversity conservation
- Better prospects for fisheries
- Improved agricultural productivity
- Reduction in land, water, and air pollution

### **Case Study: Mountain Areas Conservancy Project (MACP)**

The Mountain Areas Conservancy Project (MACP) is funded by the Global Environment Facility (GEF), the United Nations Development Programme (UNDP), and the Government of Pakistan at a total amount of US \$10.35 million for a seven-year period from 1999 to 2006.

The programme is based on a successful four-year pilot programme, the GEF Pre-Investment Facility Project titled Maintaining Biodiversity in Pakistan with Rural Community Development. The executing agency responsible for the overall coordination of the programme is the Ministry of Environment, Local Government, and Rural Development of the Government of Pakistan. The project is implemented by IUCN in Pakistan in close collaboration with the Department of Forestry, Wildlife, and Fisheries in NWFP and the Department of Forests, Parks, and Wildlife in the Northern Areas (NA). Collaborative partners are the Worldwide Fund for Nature in Pakistan (WWF), AKRSP, and the Himalayan Wildlife Foundation. The project is overseen at the national level by a Project Steering Committee and at the regional level by two Project Management Committees. The Project Management Unit is located in Islamabad. Regional Offices are in Chitral and Gilgit. There are six field units. The project is run by 37 professional staff members.

MACP is based on the premise that conservation activities are unlikely to be sustainable over the long term unless local communities are actively involved. MACP relies on the pioneering work done by AKRSP in community mobilisation and organisation and follows lessons learned during the pilot phase.

## **Project aim**

MACP aims to protect biodiversity and ensure its sustainable use in Pakistan's Karakoram, Hindu Kush, and Western Himalayan mountain ranges, through the application of a community-based conservation approach.

## **Project objectives**

The project has the following seven objectives or outputs:

- develop and strengthen capacity to conserve biodiversity at the community level;
- impart conservation values and provide avenues for information sharing on the management of wild resources;
- monitor the effects of project activities on biodiversity and socioeconomic indicators;
- assist communities to attract outside support for long-term eco-development;
- develop a knowledge base about components of biodiversity, particularly those suitable for sustainable use;
- assist the government to revise policy and legislation to better support participatory conservation; and
- develop endowment funds to meet the ongoing costs of conservancy management.

## **Project components**

The project has three principle thrusts:

- to organise, empower, and boost the capacity of local communities to conserve biodiversity at an ecological landscape level;
- to enhance the relative values of wild resources (as a conservation incentive) by promoting their sustainable use; and
- to create a policy, legislation, and financial framework conducive to community-based conservation (locally appropriate conservation committees will be organised at the valley and district levels).

## **Project tasks**

Project tasks include:

- developing village, valley, and conservancy level conservation plans;
- implementing a broadly-based conservation awareness programme;
- introducing sustainable use demonstration projects;
- enhancing scientific knowledge of biodiversity in conservancies;
- involving women in conservation;
- revising current wildlife laws;
- developing conservancy level trust funds; and
- enhancing the capacity of government departments to undertake sustainable development and biodiversity conservation.

## **Project area**

The focus is on ecological landscape management at large spatial scales. MACP activities are being undertaken in four conservancies identified using a range of biological, socioeconomic, and other criteria, with two sites in the NWFP, and two in the

NA. In the NWFP, the Tirichmir and Qashgar Conservancies both lie in the Hindu Kush. In the NA, the Gojal Conservancy lies at the point of intersection of the Karakoram range with the Pamirs in Afghanistan and China. The Nanga Parbat Conservancy, also in the NA, lies in the Western Himalayas. The Tirichmir and Gojal Conservancies are characterised as cold deserts, dominated by a dry alpine environment, although alpine meadows are found at higher elevations. Much of the landscape in these areas is treeless, with permanent snowfields found above 4,000m. In contrast, the Nanga Parbat and Qashqar Conservancies harbour ecologically important tracts of dry temperate forests. The conservancies together span an area of some 163,000 sq.km.

## **Achievements of the project**

- The impact and human capacity of community level organisations to conserve biological diversity has been strengthened. Planning and management structures are in place in the four conservancies in the NWFP and NA of Pakistan.
- Conservation values are imparted to local communities through a well-targeted conservation education and awareness drive, with avenues for the sharing of information and experiences about wild resource management among people from the four conservancies in the NWFP and NA of Pakistan.
- A system has been established for monitoring and evaluating project impacts, including ecological and socioeconomic outcomes.
- Development agencies and local communities have targeted financial and human resources towards long-term village eco-development in the four conservancies in the NWFP and NA of Pakistan.
- The knowledge base regarding the sustainable use of components of biodiversity has been enhanced and results applied to ongoing community development activities.
- Government policies and regulations have been re-moulded to support the management of the conservancies. Institutional capacities for the management of participatory conservation models have been strengthened in the NWFP and NA of Pakistan.
- A biodiversity fund is operational and contributes to the recurrent costs of conservancy management in NWFP and NA of Pakistan.

## **Recommendations**

- To fight poverty, policy makers must focus on creating a high rate of sustainable national growth, while ensuring that the benefits of that growth are spread over all parts of society.
- Environmental services agreements are now urgently needed in the face of observable global trends towards environmental degradation in mountain areas.
- Region-specific approaches need to be developed for the valuation and contracting of upstream environmental services by downstream communities and enterprises dependent on reliable quantities of good quality water, together with disaster prevention strategies.
- Capacity building educational programmes need to be started in upstream areas.
- A systematic and regular monitoring system needs to be developed to monitor mountain environments. The system should cover the three major components of mountain environments: air, land, and water.

- An early warning information system, with respect to changes in mountain environments and their consequences, is a priority need. The target groups should not be limited to mountain communities. Messages should also reach lowland communities.
- An inventory of mitigation options and best technologies needs to be disseminated to national institutions and mountain communities.
- Capacity building of national institutions must be ensured to enable monitoring of mountain environmental issues in developing countries. This should include continual monitoring complemented by project research.

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# Panel Topic – Securing Community Participation in Conservation

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## Introduction

This paper examines the opportunities and challenges in relation to community participation in ecosystem assessment and conservation in light of contemporary political ecological perspectives. There is a growing recognition of the role of communities and indigenous people in assessing, maintaining, and nurturing the diverse landscapes and biodiversity in which they live and on which they depend. However, there is a fundamental difference between outsiders and local people in terms of knowledge systems, perspectives in relation to conservation approaches, methodological frameworks, and interests. There is also a difference in the power relationships between different actors – state, private, environmentalists, NGOs, and local people. The phrase ‘community based’ can mean different things to different people, making their ways of dealing with local people also quite different. In this paper, I will employ the term ‘community’ consistently to refer to indigenous people, place-based practices, and local knowledge, as well as to the legal and legitimate entity. Community participation does not simply mean convincing a local community to plant trees to prevent soil erosion. It is more important to have the participation of the community and local people in the production, validation, and application of scientific knowledge; in the negotiation of access rights to natural resources, markets, information, and technology; in the assessment of environmental risks and climate changes; and even in local governance and decision-making. With increasing globalisation and climate change, we should not ignore the large uncertainties that local communities face as they strive to use ecosystems and sustain the diverse landscapes in which they live. With these threats to local environments and cultures, it is essential not only to document indigenous and local knowledge and practices, but also, most importantly, to enhance the capacity of local people to strengthen their evolving technical innovations, and to improve their livelihoods and human dignity. In this paper, I will examine how to define a community; what we have learned so far from community-driven conservation; and what the pathways are for sustainable conservation and development.

## What we have learned about coupled human-environment systems

There are many examples of successful conservation initiatives by local people, adapted to the changing interaction between humans and ecosystems, and the power relations between the local community and external state, and non-state, institutions. These examples include sacred groves in India, Tibetan sacred mountains in China, forest user groups in Nepal, and initiatives by agro-pastoralist peoples in the Himalayas, Western Ghats, and on the Tibetan plateau. However, much of the thinking on biodiversity conservation and ecosystem management is still based on separating nature from culture. This is reflected in the history of ecosystem research and conservation practices over the past century. That people are a threat to nature, was a widely framed concept in conservation until the 1970s (Jeanrenaud 2002). People's

activities, such as shifting cultivation and the collection of forest products, were viewed as the principal threat to stable plant succession, climax vegetation, and even the functioning of ecosystems and ecosystem development (Odum 1969). The transformation of landscapes has been, and will continue to be, influenced by predominantly cultural perceptions of nature as well as by sociopolitical and economic demands and aspirations. Entire land covers have been introduced, or removed, in order to 'domesticate' the land, or recreate wilderness (Crumley 1994). On the other hand, states, in dealing with diverse natural and social environments, attempt to make these environments comprehensible by creating 'thin simplifications', or 'legible' landscapes as described by Scott (1998). Since the end of the 1970s, the international conservation movement has adopted various 'conservation with development' narratives, promoting the idea of an integrated conservation and development programme (Kremen et al. 1994; Worah 2002). The very concept of ecosystems reflects changes in thinking about human-environment interactions, or humans as part of ecosystems, rejecting the idea of a fixed equilibrium, closed systems, and static nature (Moran 1990). Proactive human management might contribute to maintaining biological diversity in ecosystems. Building a vision for the new millennium on conservation requires overcoming the dichotomy of nature versus culture. The high cost, inadequate protection, and ineffective management of public protected areas have led to thoughts of an alternative conservation approach. More attention has been paid to community-driven conservation, outside public protected areas, in community owned forestlands as well as agricultural landscapes (Molnar et al. 2004).

However, coupled human-environment systems have been influenced by the interactions in globalisation and market-economic policies, as these systems are interrelated because the flow of resources, goods, and services increasingly transcends national and regional boundaries. State policies, market pressure, and technological changes have a great impact on both production and consumption. These impacts include land use intensification and transformation; population dynamics and migration; off-farm opportunities and urbanisation; substitution of local technologies; and changes to indigenous cultures. These impacts affect local livelihoods, institutions, the power relations between different actors, and the relationship between people and nature (Granfelt 1999).

## **Defining 'Community'**

### **The heterogeneity of communities**

The notion of 'community', in the sense of a homogeneous entity with similar needs and challenges, should be treated with caution in resource management. Within communities, there is much variation in terms of knowledge, interests, livelihood strategies, demographics, the networks with which they interact, and the nature of their interaction with ecosystems. Members of the Hani (Akha) ethnic group have the same cultural and historical background but have developed totally different land use practices after migrating into different ecosystems (Xu et al. 1999). Some of the Hani moved to the Honghe (Red River) Basin in southeast Yunnan and now engage in

terraced paddy agriculture. Other Hani people settled in Xishuangbanna in Yunnan, including those who later migrated to Laos, Myanmar, and Northern Thailand, and practice shifting cultivation. The outside perception of indigenous communities is also shaped by political discourse. The Hani shifting cultivators are more environmentally-friendly in China and more destructive to nature and forest ecosystems in Thailand (Sturgeon 2000). The political interpretation and identification of community, land use, and cultural identity also determines relations between people and nature. Local communities do not live in a vacuum. Their knowledge, practices, and innovations are influenced by the policies, markets, and other sociocultural networks surrounding them. Within communities, conflict exists between different resource users, such as old and young, or birdwatchers and hunters, or tourism developers and conservationists. Conflict has increased between certain Tibetan communities over matsutake mushroom harvesting due to the increase in the market value of this product in southwest China (Yeh 2000). This conflict has arisen even though all of these communities are conceivably part of the same ethnic group. For many rural households in the HKH region, off-farm work, wage labour, and the remittance economy have replaced agriculture as the main source of income. The perception and attitude of different family members, particularly young people, towards nature and the ecosystem has been changing. However, most family members still maintain a link to the ecosystem by owning some livestock, cultivating crops, harvesting fodder and fuelwood, and collecting non-timber forest products (NTFPs) for their livelihood. In the HKH region, there is considerable variation in people's interactions with, and connectedness to, ecosystems. This variation is determined by their geographical location, household economy, social networks, and institutional affiliations, as well as their power relations with state and non-state actors, such as NGOs and the private sector. For example, although the Hani shifting cultivators are from the same ethnic group, their way of interacting with forest ecosystems can be quite different. They may do more damage in Thailand because of lack of land tenure security without citizenship. Differentiation in livelihood strategies is more complex than ethnicity, gender, or age grouping. The challenge in securing community participation in conservation is to resolve these contradictions between the diverse functions of ecosystems and the multiple needs of people, within and among communities, as well as between locals and outsiders. Therefore the vernacular meaning of 'community' is a collective identity that arises from, and helps to reproduce, particular patterns within the political economy of the coupled human-environment system in a specific place.

### **Socio-cultural networks: How are communities connected?**

One of the contestable myths about mountain 'communities' in the HKH region is their isolation or inaccessibility (Jodha 1997). Places and people are often not connected in expected ways, as conceived by the state or outsiders, with paved roads, a telecommunications network, post office, and central marketplace. However, communities are connected and linked to these places in their own ways, both visible and invisible. These 'peripheral' people and communities, as referred to by Harrell (1995), live on the edges of places that are linked to centres, that are distant and difficult to reach, but are not necessarily isolated and unconnected. For example,

<b>Table 1: Summary of the people-nature relationship in international conservation</b>				
<b>Variable</b>	<b>1960+</b>	<b>1980+</b>	<b>1990+</b>	<b>2004, IUCN congress</b>
Perception of nature	Wilderness	Ecosystems; biodiversity; ecoregions	Culture in nature and nature in culture	People and nature – only one world
Environmental values	Theocentric and anthropocentric	Anthropocentric and cosmocentric	Anthropocentric and cosmocentric	Anthropocentric and cosmocentric
Problem diagnosis	Overpopulation; exceeding carrying capacity	Poverty; overpopulation	Power relations; north - south inequalities; what counts as a problem, and to whom?	Population dynamics; consumption patterns; market failures; policy distortions; poverty and inequity
Representations of local people	People are the threat	People can't be ignored; people are a resource	Support to rural people	Many voices
Solutions and technologies	Exclusionary protected areas	Buffer zones; integrated conservation and development programmes; sustainable use	Alternative protected areas; participatory management, human rights	Community driven and community conserved areas
Power relations	Alliances with elites	Technocratic alliances	Alliances with grass -roots	Proactive of indigenous people
Key influences	Colonial conservation; elitist interests	Sustainable development debates; growing concern for livelihoods	Democracy/human rights movement; participatory development; post - modern influence on natural and social sciences	Civil rights; cultural diversity; private sectors; questioning 'sciences'
Source: Modified from Jeanrenaud (2002)				

caravans served extensively as market structures and formed a socio-cultural network among mountain, lowland, and even city places in the region for hundreds of years, as studied by Ann Maxwell Hill (1998). Here is her description of the long distance caravan trade based in Yunnan:

“Before the advent of colonialism in Southeast Asia, roughly around 1850, the caravan trade as a market structure might best be described as a dendritic, or treelike, system branching out from Kunming and Dali into ever more remote areas until the difficulties of terrain and low levels of commodity production [largely tea, cotton and opium] made further expansion of the system unprofitable. ...They traversed an area that included Upper Burma to the west, Tibet to the north, the provinces of Guizhou and Guangxi to the east and upland Southeast Asia to the south.”

Thus, rather than being isolated and detached, most upland communities were connected in their own cultural ways. Another example is the practice of genealogy by many ethnic groups in the region. Two people from the same ethnic group may be able to sit together, and trace their genealogy back to a shared ancestor, even though they might live at a distance from each other and practise different production techniques. These social networks play an important role in the sharing of knowledge, information, technology, and environmental risks. For example, the Yi people have a long history of migration, and genealogy is very important to them. When Yi people pass away, they

believe that their souls travel back to their origins for peace. Their genealogy is cited during funeral rituals and each generation links to particular places and times on the historical migration route. The singing and reciting of the genealogical trees also mentions the forests, land, rivers, animals, and other environmental features, at each place or stop where their ancestors lived. The soul of the dead has to pass each place to return to the origin of the Yi people (Xu et al. 2005).

Assigning the myth of isolation to others often carries with it implicit assumptions about ignorance, parochialism, resistance to change, and other deficiencies that require correction. It is better to start with the assumption that mountain communities are peripheral but connected, and then ask how, and with what consequences (Coward 2003).

### **The democratised community and its legal personality**

The democratisation of community decision-making is essential in order to ensure efficient resource management and equitable benefit distribution locally and to adapt to changing markets, policies, and climate, as well as accommodate the diversity of needs and interests within a community (Ribot 2002). Customary institutions are not always accountable to local people. State induced institutions often do not work, for example, the failure of collectivisation in socialist countries. Good governance, at the community level, calls for a new set of place-based and culturally embedded rules, made in a dynamic and democratic fashion, which address environmental sustainability and human well-being.

After the implementation of the 1998 Village Organic Law in China, village chiefs and village committees received new responsibilities and rights relating to local natural resource management. The local people democratically elect their village chief. However not all locally elected authorities are perfectly accountable to the local people. A number of problems are associated with these processes. Firstly, evidence suggests that there is inadequate external monitoring and evaluation of the performance of local authorities. Village assembly meetings, which provide internal monitoring, are ineffective for this purpose because village chiefs can easily manipulate the assembly. Secondly, the election process is often poorly executed due to low literacy and/or cultural barriers, and the process of candidate selection, voting, and vote counting is often riddled with errors. Thirdly, one of the major tasks of the local authority or administrative village is to collect taxes from villagers. However, as villagers receive no services and cannot influence decision making at higher levels of government, this taxation has created mistrust between the local government and the villagers and has undermined the credibility of elected village leaders. Nobody expects the awareness and capacity of villagers for self-government to develop overnight. It takes time to empower a local community. However, with the present constraints, electoral accountability has essentially become a wasted opportunity (Xu and Ribot 2004).

Another unsolved issue is the legal persona of the 'community'. Do local communities have legal status or power? Both natural individuals and corporations have legal status,

but not communities. This lack of legal status has put communities at a disadvantage in disputes. The state is comfortable in decentralising power to the lowest level of government, in the case of China the township level. However, this level of government is not systematically accountable to the local community and instead is often upwardly accountable to higher authorities. Communities have received either no power at all, or limited power. Further, communities have extremely limited financial resources to exercise this power. Privatisation is not a form of decentralisation. It is neither democratic nor representative of the collective interests or actions. Therefore, it is not a solution, particularly for the management of common property resources, such as forestlands.

## **Negotiating between community, state, and non-state institutions**

For most of last century, the state, in the pursuit of state building and modernisation, has accepted a technocratic and managerial view of ecological and social systems. It is a view in which the power elites and their experts are in control of knowledge, and are seen as having the skills and responsibility to do everything, from land use planning to institutional arrangement. Under the 'state knows best' or 'scientist knows best' system, the environment and forest ecosystems have typically been degraded, for example by unsustainable logging practices and mono-cultural plantations, that provide only a small subset of the original set of goods and services to a much smaller group of beneficiaries (Lebel et al. 2004). At the same time, conservation areas have been set aside without recognition or adequate compensation to indigenous communities. Such traditional command and state control management are proving ineffective, inefficient, and inequitable, as well as favouring corruption and ultimately hurting communities. A 'market knows best' perspective has its own limitations, due to its underlying principle of maximisation of yields and profits, without reference to who the benefits flow to, or who pays for long-term environmental services. A strong counter-reaction to state and corporate-centred views of how natural resources should be managed, is the emergence of community participation in such areas as community forestry and community-driven conservation. In essence, they argue that 'local communities or locals know best', emphasising local knowledge. However, this approach also has its limitations due to global environmental change (e.g., climate change) and global governance systems (e.g., the World Trade Organization for free trade). The great challenges presented by climate change and the globalisation of the economy call for a new institutional arrangement – a power relationship and partnership between local communities and state and non-state actors, particularly the private sector, as well as NGOs. Regulatory pluralism applies not only to communities, but also to the state, NGOs, and private corporations in order to secure community participation in conservation. An effective system must provide sufficient incentives and enabling conditions for communities to manage their resource base and blend conservation and use goals. There is a growing awareness in the private sector of the biodiversity spin-off for off-site environmental services. An enabling environment for community-driven conservation includes i) appreciating local knowledge, ii) strengthening common property rights and collective actions, iii) rewarding the community, and iv) representation of the community in decision-making.

## **Appreciating local knowledge**

Indigenous people, who have lived in mountain habitats for hundreds of years, have developed, and continued to practise, ways of living and belief systems based on their intimate relationship with the mountain environment. These ways of living and belief systems have generated, and draw on, a deep knowledge of plants, wildlife, vegetation, and ecosystems, as well as soil, water, and microenvironments. Understanding the complexities of different cultural perceptions of land use, landscapes, management of resources, and local institutional arrangements contributes to alternative and more effective strategies for conservation and ecosystem management. Local knowledge systems are not static, but ever changing and evolving, because human-ecosystem interactions are process-oriented and dynamic. Therefore, the drivers of knowledge, the ecological system, and local responses co-evolve and are difficult to separate. No community is immune to changes occurring in their environment. Among the most powerful forces that influence local cultures, knowledge, and ecological systems are various government policies and the expansion of regional, national, and international markets. These forces stimulate the privatisation of land and natural resources, as well as aiming to 'fix' populations and property in space, leading to loss of traditional lifestyles, mobility, and flexibility (for example limiting of shifting cultivation, and sedentarisation of pastoralist, and nomadic peoples).

On the other hand, there are an increasing number of projects and programmes, which have put local knowledge, practices, and innovation at the centre of conservation and development. For example, a recent development in nature conservation tries to link traditional practices in sacred areas to conservation when creating protected areas, and going even further by translating the sacred into conservation legislation to grant land and cultural rights. Article 8(j) of the Convention on Biological Diversity specifically addresses local indigenous peoples and their knowledge. The Working Group on Intellectual Property Rights was established in 1990 by the Global Coalition for Bio-Cultural Diversity to unite indigenous peoples, scientific organisations, and environmental groups to develop a strategy for the use of traditional knowledge and alternative approaches using people-centred conservation models (Posey and Dutfield 1996).

Language is also crucial to locating biodiversity. There is an increasing concern that when languages disappear, knowledge may also disappear (Cox 2000). UNESCO's 'Safeguarding of the Endangered Languages' programme (UNESCO 1993) is a global initiative to protect indigenous languages and intangible cultural heritages. Some initiatives are also concerned with local knowledge systems and their associated landscapes and agrobiodiversity. An example is the FAO programme 'Globally Important Indigenous Agricultural Heritage Systems', which aims to conserve place-specific sites in-situ, that represent different production systems and their associated landscapes.



## **Strengthening common property rights and collective actions**

Over the past several decades, it has become increasingly accepted that the formal protected areas system alone, cannot save the world's biodiversity. Managing public-owned protected areas is a heavy burden for governments. Despite the creative promotion of ecotourism, private concessions, and the leveraging of complementary rural development funds, few protected area sites can capture or generate the resources needed to manage their biodiversity adequately. Land tenure conflict and population pressure make it extremely difficult to extend or reconfigure the protected area system to include under-represented areas. Simply shifting land tenure from the state to the individual does not work in forest resource management. In China, 60% of the total forest area is owned by local communities (Miao et al. 2004). In the past 15 years, the amount of forest area under community ownership or management has doubled in developing countries. Currently 22% of forests in the tropics are community-administered, and projections estimate that the area will at least double again over the next 15 years (White and Martin 2002). Global estimates state that 50% of the protected areas established in the last 80 years, overlap with indigenous customary lands and resources (86% in Latin America) (Borrini-Feyerabend 2003). As part of the tenure shift, or reality of overlap with customary boundaries, conservation strategies should emphasis the strengthening of community institutions, including the strengthening of common property rights and collective actions, in resource management. Diverse tenure arrangements and flexibility in relation to common property is the guiding principle, rather than rigid control as in state property, or a simple transfer as for private ownership. Privatisation is not community-based natural resource management.

## **Towards rewarding community conservation and sustainable management**

The great majority of the world's population, including most of both lowland and upland people in the HKH region, depend upon mountain ecosystems for environmental goods and services. River basins originating in the mountains provide vital watershed services for lowland people living in the rice bowls of Bangladesh and India for production, fishing, irrigation, and transportation. Connectivity in the coupled human-environment system demonstrates the linkage between cultural and biological diversity, and ecosystem goods and services, in upland and lowland interactions. Rewarding local communities for environmental services, including water, biodiversity, and carbon becomes a new political and economic paradox, but is also a complicated response. Rewards can be direct payments such as funds, or indirect compensation such as the provision of technical and development support. Payment for environmental services is a means by which downstream users of resources (e.g., water) can pay, in cash or kind, the upstream guardians of those resources for their protective services. A simple example of payment for environmental services is the downstream hydropower corporations and industries that pay a percentage of their profits to upstream communities in return for the conservation or protection of the resource – such as reforestation of logged forests by forest management groups, the release of water in drier winter months, and the replanting of degraded areas. Rewards can also be the

certification of particular products (including forest products and agriculture) and their means of extraction. The criteria to take into account are the biological and ecological components of production areas and ecosystems. 'Fair trade' is another example of rewarding community conservation. Fair trade was initiated to help disadvantaged communities by paying better prices and providing better trading conditions, together with raising consumer awareness about their role as buyers.

## **Representation of community in decision making**

One of the most difficult challenges for conservation and ecosystem management on a large scale is to represent local world views in higher-scale decisions. The importance of integrating local views into higher-scale decisions is multiple. It allows policy makers to design policies that enable local people to optimise their uses of ecosystems, while at the same time allowing higher-scale understanding to inform policy making. It also creates the space for local people to engage in conservation and resource management and therefore work with, rather than against, the objectives of those operating and making policy at higher-scales.

Representation channels are multiple. Some systems of communication already exist in the party system. Local views are communicated by researchers who understand and can translate this local understanding into language accessible to policy makers. Local people are also represented through locally elected officials at the administrative village level. The challenge for the forestry service is to design a system that enables local knowledge and local aspirations to be represented in decision making. The trick is to design a system that is consistent with the new decentralised approach to development and to forestry and conservation. Representation matters if local knowledge and local labour are to be mobilised for local good and for the good of all higher levels of the political-administrative organisation in which they are nested. If local people are able to make decisions, then their world view will be included in the decisions that they make.

## **Conclusions**

For a long time, a dichotomous approach to nature-culture relations has been dominant in debates and strategies on conservation and the management of natural resources. Certain cultural perceptions of landscapes have become dominant or imposed through economic and political forces, often to the detriment of local knowledge, practices, and innovations. The state-building process and scientific knowledge development have served to justify simplified landscape and local institutional changes, which, in many cases, have led to high levels of environmental degradation, poverty, and food insecurity. Understanding the complexities of different cultural perceptions of landscapes, the interactions between humans and nature, local knowledge systems, and institutional arrangements contributes to the development of alternative strategies for ecosystem management and socioeconomic development. The key to community-driven conservation is to develop community-based science. This calls for the participation of research professionals, development practitioners, and local NGOs to support local communities in developing their own knowledge, practices, and

innovations to adopt and adapt global influences to foster their own livelihoods, on the basis of their own cultural repertoires and identities. Community-driven conservation cannot be achieved without a transfer of power, and accountable and representative local institutions. The road to community-driven conservation and science has moved, and continues to move, back and forth between exclusion and inclusion of the community.

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## **Panel Topic – Geographic Information for Sustainable Mountain Development in the Hindu Kush-Himalayan Region**

*Mr Basanta Shrestha, Division Head, MENRIS, ICIMOD*

### **Introduction**

The Hindu Kush-Himalayas (HKH) extend from Afghanistan to Myanmar and are the world's highest mountain ecosystem. They have the youngest geological formations and contain lands with diverse human cultures, religions, indigenous traditional systems, and socioeconomic conditions. The majority of the region's population live in poverty and depend upon fragile natural resources for their livelihood. The HKH range offers important ecosystem services for life support, such as a wide range of biodiversity, medicinal plants, fresh water reserves, hydropower, minerals, and spectacular pristine views with a potential for ecotourism. However, rapid population growth, the development of infrastructure, and the exploitation of the natural resource base, combined with global warming, are creating pressure on mountain ecosystems. Mountain ecosystems are experiencing unsustainable human practices leading to the depletion of natural resource bases and environmental degradation.

ICIMOD is the only regional centre working for the sustainable livelihood of the mountain people and promoting economically and environmentally sound development

of mountain ecosystems in the HKH region. ICIMOD has been working to facilitate the generation and sharing of mountain specific information and knowledge.

Many issues in relation to mountain development, such as environmental degradation, deforestation, soil erosion, poverty, migration, floods, and the sharing of water resources, have a strong geographic component. Geographic information plays a significant role in sustainable decision making.

## **The role of geographic information in sustainable mountain development**

Sustainable mountain development poses enormous challenges due to a lack of scientific understanding of mountain ecosystems and their important function in providing ecosystem services that support livelihoods in mountain communities, as well as in communities downstream. There is a lack of credible data and information, and local and national institutions have inadequate capacity to integrate multi-sectoral analysis for use in problem-oriented analysis of mountain areas. The problem is further aggravated by a lack of coordination between national agencies, together with limited regional cooperation in terms of data and information sharing and exchange. Finally, mountain areas are often marginalised or neglected by the development mainstream in countries which lack mountain-friendly policies.

Decisions about sustainable and equitable development have to be based on accurate and reliable information. Over the last decade or so, geographic information and related technologies have made remarkable advancements, adding a new dimension to the integration and analysis of divergent sources of information. At the same time, the cost of hardware and software has decreased. With the significant growth in public domain geographic datasets, there has been widespread adoption of geographic information systems (GIS). GIS are evolving in ways that will increase their prominence in decision-making processes by integrating many disciplines and by adding value to our decisions. The increasing use of decision support systems based on geographic information, and the information thus processed through these simple yet sophisticated tools, can render information and knowledge useful for sustainable decision making. Hence, access to geographic information is crucial, and there is a need to bridge the geographic information and knowledge gap in the region.

Building an infrastructure for geographic information is becoming as important as building other kinds of infrastructure, such as roads or telecommunications. Geographic information infrastructure has been conceived as an environment where the basic geographic datasets are readily available; existing geographic information is well documented; available geographic information conforms to accepted standards; there are policies to encourage the sharing and exchange of geographic information; and there are adequate human and technical resources to maintain and manage geographic information. Geographic information infrastructure can be seen as the broad policy, organisational, technical, and financial arrangements necessary to support access to geographic information. The concept is gaining importance at the local, national,

regional, and global levels, and many nations and regional and international organisations are embracing such a framework.

## **The MENRIS programme at ICIMOD**

Agenda 21 of Chapter 40 of the UN Conference on Environment and Development in Rio de Janeiro in 1992 emphasises the need for data and information for decision making at all levels. This was further reiterated and emphasised at the Bishkek Global Mountain Summit of the UN's International Year of the Mountains 2002, and in the international partnership in mountain development at the World Summit on Sustainable Development (WSSD). Realising the potential of geographic information for sustainable mountain development, ICIMOD, through its Mountain Environment and Natural Resources Information Systems (MENRIS) programme, has been working on promoting the use of geographic information for the management of natural resources and environmental monitoring in the HKH region, through a decentralised network of partner institutions in its regional member countries. MENRIS is operationalising its strategy by providing access to geographic information and knowledge through four programmatic components, namely, capacity building and networking; integrated GIS data management; applications and spatial decision support systems; and a metadata clearing house. These are the essential elements, or founding blocks, of a regional geographic information infrastructure for the HKH region.

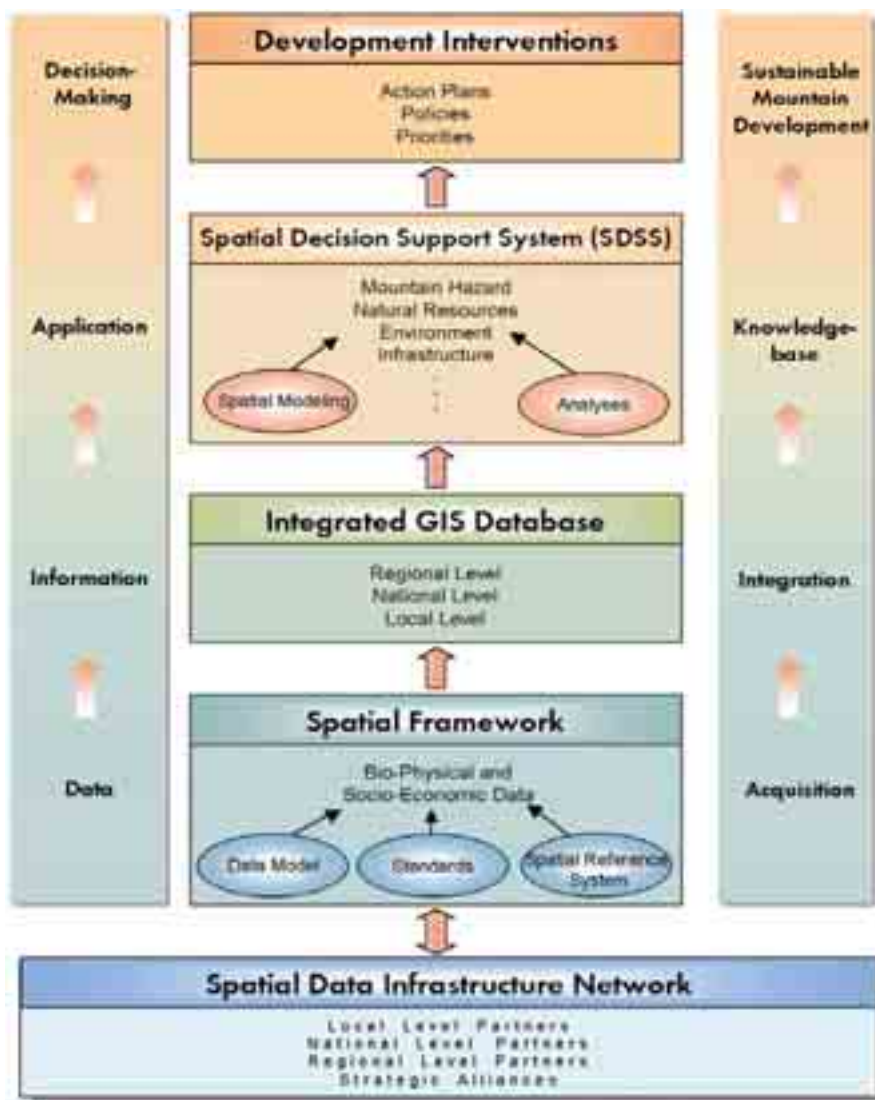
Partnerships between national and regional institutions, and the capacity building of these institutions, are MENRIS's major strategies for the development of a regional geographic information infrastructure. The partnership initiative was designed to extend the fully functional capabilities of national institutions by developing mutually supportive relationships with a focus on training and the dissemination of geo-information technology and its applications.

ICIMOD has developed a strategy to establish a framework for a regional geographic information infrastructure in the HKH region and through this continue its efforts to increase the availability and accessibility of organised geographic information to contribute to local, national, and regional decision making needs in relation to sustainable mountain development. The conceptual framework for utilising geographic information for sustainable mountain development is shown in Figure 1.

## **Framework for using geographic information for sustainable mountain development**

The framework describes the utilisation and management of geographic information in partnership with national and regional organisations in the region. Use of GIS technology is in the early stages in the region and especially for the mountain areas, thus considerable emphasis has been placed on capacity building and the creation of a mountain GIS network. The framework provides a mechanism for the assimilation of both biophysical and socioeconomic information through an organised information network consisting of national partner institutions and other regional/international partners. The geographic information framework defines the aggregation of this data





**Figure 1: Conceptual framework for using geographic information to support sustainable mountain development**

and information with accepted standards at different levels (local, national, and regional) to generate integrated databases for the HKH region. These integrated databases then serve as a foundation for many geographic information applications. The spatial modelling tools, combined with the knowledge of thematic experts, will help to model key components of mountain environments in the region, such as biodiversity, climate change, snow and glaciers, land use/land cover, infrastructure development, and many more. Ultimately, this framework will contribute to increasing the information and knowledge base for a decision support system to meet our prime concerns in solving the complex problems of mountain environments.



## Geographic information applications for mountain areas

ICIMOD has adopted a strategic approach to assist its Regional Member Countries to capture the opportunities provided by geographic information, and its related technologies, for organised information networking and improved decision making. Through its close contacts and collaboration with research institutions, space and software agencies, and especially its strategic alliance with key GIS partners around the world, ICIMOD has fostered the establishment of a strong GIS network (of more than 120 institutions) to serve this vast and diverse region (Figure 2). Through these efforts, GIS technology has made significant inroads in the HKH region, and has been used effectively to support policy formulation, planning, and the management of natural and human resources for sustainable mountain development. Many applications, covering a diverse range of uses and decision support systems suitable for mountain areas, have been developed at local, national, and regional levels. Some of the important applications of GIS, undertaken by ICIMOD together with partner organisations in the HKH region, are as follow:

- land use/land cover mapping at the regional level;
- vegetation monitoring using remote sensing data;
- sustainable development indicators;
- inventory of glaciers, glacial lakes and potential impact of GLOFs due to global warming;
- urban and municipal planning;
- biodiversity mapping and assessment using remote sensing data;
- water resources management applications;
- decision support system for national park management; and
- ecoregional agricultural and land use planning for mountain ecosystems.



**Figure 2: The HKH region and its river basins** (Source: ESRI data and maps MENRIS)

Further, a mountain GIS portal has been developed to encourage the sharing of geographic information-based resources and to strengthen the existing geographic information network in the region. The GIS portal serves as both a ‘user’ and ‘provider’ of geographic based information and as a virtual platform for addressing issues related to sustainable mountain development in the HKH region (Figure 3).



**Figure 3: The Mountain GIS portal with its biodiversity theme**

## Conclusion

Mountains have very distinct spatial and temporal expressions and many of the planning and decision-making processes in mountain areas are influenced by geographic information. Given the dynamic character of natural resources, which undergo rapid changes in mountain regions, there is a constant need to update information and review dynamic linkages. Geographic information infrastructure provides a unifying framework for the integration of many different kinds of information so that we can better understand mountain ecosystems and support their functioning and management. Moreover, many problems that we face in the region are transboundary in nature. Using such a technology and framework can promote regional cooperation among the participating Regional Member Countries.

In the recent past, geographic information and related technologies have improved our capability to handle geographic information. This has made it necessary for different stakeholders to re-examine their role with respect to the use and supply of such information. Using geographic information based decision support systems, the information products can be used to help indicate alternative strategies to mountain development practitioners and policy/decision makers. Such a framework has proven to be a viable technological and institutional option for sustainable mountain development. ICIMOD, with its institutional foundation and active networks of national partners and key GIS organisations around the world, can leapfrog national efforts in the HKH region to attain higher stages of sustainable development using geographic information infrastructure.

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## Discussion and Recommendations: Working Session I

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

- upstream-downstream relationships, and
- use of knowledge thus far accumulated.

Participants emphasised that upstream problems tend to be neglected in the existing social and economic systems and that upstream environmental services are not well compensated, although there are some recent efforts focused more towards development in upstream areas.

With respect to knowledge management, concerns were raised about how the knowledge generated is being put into practice, and what constraints there are to policy/decision makers using this knowledge.

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 I are listed below.

- In relation to advanced technology: To avoid misinterpretation of data and technological errors, use of technology must foresee the involvement of experts, while reaching out to as wide a user community as possible.
- In relation to climate change: It was suggested that ICIMOD persuade GEF and others to fund related projects and to take on joint studies of Indian mountain ecosystems.

- In relation to environmental services: It was suggested that a systematic mountain environment monitoring system be developed together with associated capacity building of national institutions. Other recommendations included environmental services agreements and region specific approaches to the valuation and contracting of upstream environmental services. There is also a need for policy makers to focus on creating a high rate of sustainable national growth.
- In relation to community participation in ecosystem assessment: It was suggested that a participatory approach to learning be developed by sharing and creating space for local communities in terms of representation, resilience, and re-adaptation, and by creating a level playing field. A call was made for community-based science.
- It was also recommended that communities be involved in addressing sustainable development issues. It was pointed out that given proper training, increased population could be turned into a valuable asset.



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

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*Chair: Mr Peter Gueller*





# Keynote Paper – Securing Sustainable Use of Mountain Resources

*Mr Phrang Roy, Assistant President, Asia Pacific, IFAD<sup>1</sup>*

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

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<sup>1</sup>Most 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

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### 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 <sup>a</sup>	8	0		45,000 <sup>a</sup>	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 <sup>b</sup>	13	0		0		140,000 <sup>b</sup>	8
<b>Total</b>	<b>1,080,000</b>	<b>100</b>	<b>580,000</b>	<b>100</b>	<b>85,000</b>	<b>100</b>	<b>1,745,000<sup>c</sup></b>	<b>100</b>
% of total	62		35		8		100	

**Editor's note :** some of these figures have been revised since this paper was presented to <sup>a</sup>38,500; <sup>b</sup>147,000; <sup>c</sup>1,746,000. 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 <sup>a</sup>	326	1105	140 <sup>b</sup>	1745 <sup>c</sup>
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 <sup>a</sup>38.5; <sup>b</sup>147; <sup>c</sup>1746. 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

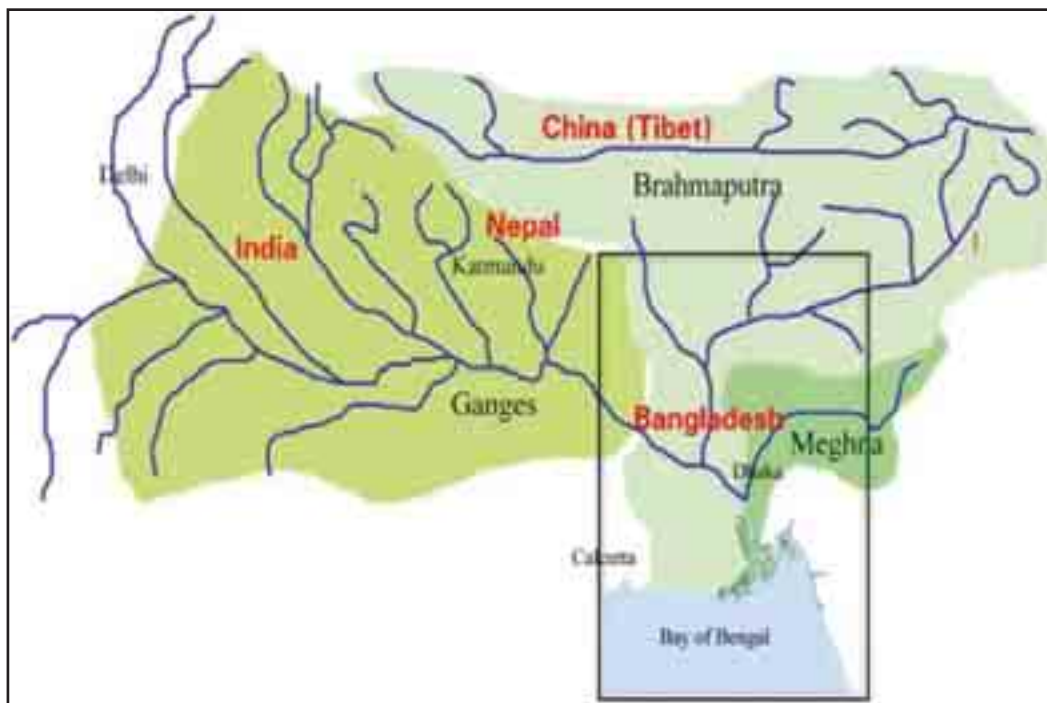


Figure 2: Catchments of the Ganges, Brahmaputra, and Meghna rivers

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

Table 5: Groundwater potential of the GBM basin (billion m <sup>3</sup> )			
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**

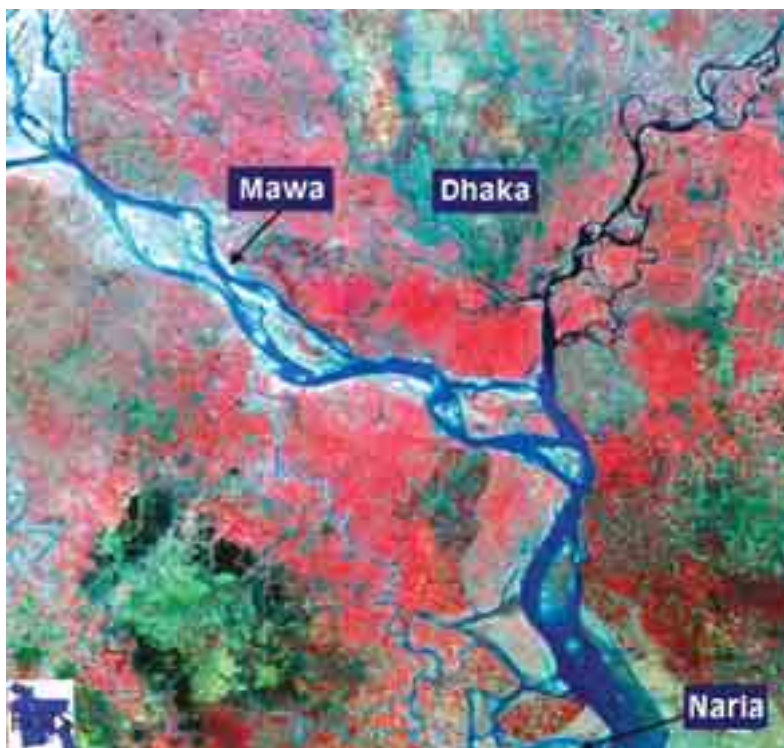
Water quality in the region has progressively deteriorated due to increased withdrawals for various uses leaving insufficient flows to dilute pollutants during lean periods. The increased use of agrochemicals and the discharge of untreated domestic sewage and industrial effluents into rivers have aggravated 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**

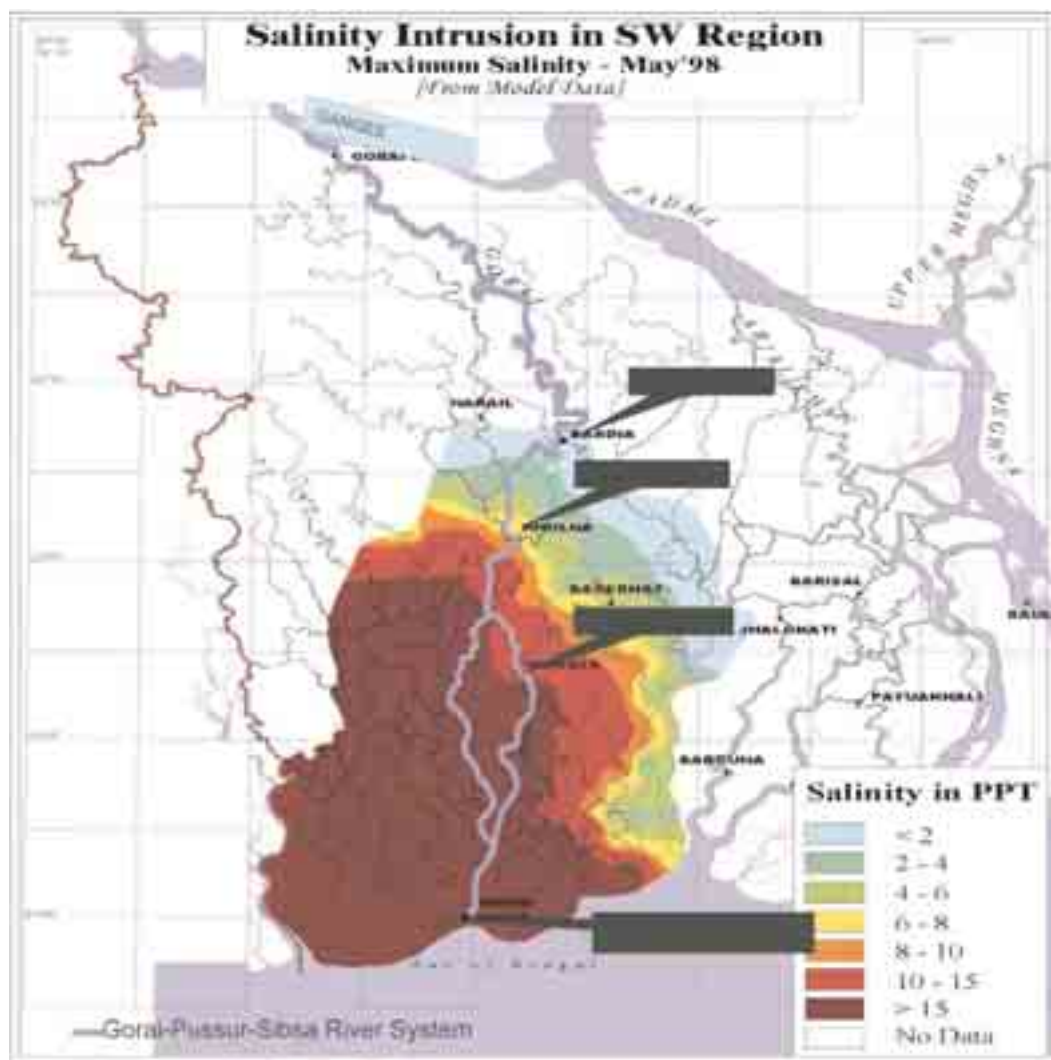




**Figure 6: Sedimentation in the river basin**



**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 Mahakhali 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 Corporation 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 21<sup>st</sup> 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.<sup>1</sup>

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

<sup>1</sup> 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](http://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.<sup>2</sup>

## **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

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<sup>2</sup> 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.

**Session III**  
**Securing Livelihoods**

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*Chair: Dr Hans Gsaenger*



# Keynote Paper – Securing Livelihoods for Mountain People

*Dr Mohan Man Sainju, Vice-Chairperson, Poverty Alleviation Fund<sup>1</sup>*

## Introduction

The Hindu Kush-Himalayan (HKH) region is home to an estimated 150 million people who depend directly or indirectly on the land, forests, pastures, water, and other resources that the mountains harbour. In addition, these resources provide environmental goods and services to an even larger downstream population, estimated to be in excess of 500 million. Despite being rich in resources, a vast majority of mountain people live in the midst of poverty and in the most difficult situations. They are primarily dependent on the integrated use of subsistence agriculture and natural resources, from which they are neither able to generate economic surplus, nor to find off-farm employment opportunities. Except during the peak agricultural season, a large number of mountain people are underemployed and are forced to migrate seasonally to the plains in search of employment, as off-farm opportunities are not forthcoming. Food deficit is a recurring problem in large parts of mountain areas and is accentuated by the increasing population pressure on the one hand, and the declining supply of natural resources on the other. Soil erosion is believed to be increasing, as people have been unable to replenish the nutrient loss from their farms and have been forced to move cultivation to steeper mountain slopes in search of food. Many marginalised communities and farmers have only limited access to production technologies and inputs, which further lowers farm productivity. Throughout mountain areas, coping strategies have relied on multiple forms of livelihood activities.

The HKH is one of the world's ten 'mega-centres' in terms of biodiversity and also forms one of twenty-five global 'biodiversity hotspots'. Approximately 39% of the HKH is pasture, 21% is forest, 11% is protected area, and 5% is agricultural land. The diverse ecosystems found in the varied land use areas of the HKH have been subjected to great stress and continue to face multiple threats, even in protected areas. The rapid degradation and deterioration of the forest resource base has multiple consequences in terms of energy and water scarcity, biodiversity loss, and soil erosion. These all threaten the livelihoods, not only of the present, but also of future generations.

Poor communication and transport networks, high transport costs, economic isolation, high overhead costs, and the slow pace of transformation are other characteristics of most mountain areas that have made development efforts relatively expensive.

Six of the world's longest rivers originate in the HKH and meet the water needs of over 600 million people (ICIMOD 2003a). Despite the huge potential for power generation to meet the growing demand of industry in the plains, water resources have remained largely untapped. The few water resources that have been tapped have only marginally benefited mountain people.

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<sup>1</sup> The assistance received from Dr Kamal Banskota and ICIMOD in the preparation of this speech is duly appreciated.

Market penetration is gradually breaking up the centuries old relative isolation of mountain people. While the growing linkage between highlands and lowlands has brought some benefits to mountain people, terms of trade continue to be unfavourable to mountain areas. Mountain areas have not received fair compensation for resources exploited for the benefit of the lowlands. With globalisation, this state of affairs is likely to become further accentuated.

Mountain people have a rich and diverse cultural heritage. However, due to the poor appreciation and understanding of the customs, culture, and way of life of mountain people, this heritage is, in most cases, historically marginalised from the mainstream. The varied challenges faced by the HKH region, and conflict over contested resources and assets critical for the livelihood of mountain communities, are challenging the quality of life of mountain people. This is visible as the mountains are also home to a disproportionate number of violent conflicts. Some of these conflicts are becoming serious and widespread enough to challenge state stability.

## **Overview of the key issues in global, regional, and national contexts: challenges to securing livelihoods**

Despite the hardships that mountain people face in carving out their livelihoods, many lessons have been learned which clearly show that vulnerabilities can be transformed into economic security. Some important examples are as follow.

### **Livelihoods and harnessing mountain niches**

Livelihoods in the mountains can be summarised in terms of livelihood resources that people have (both tangible and intangible), the livelihood strategies that people pursue, and the livelihood outcomes that they are able to achieve. Resources, strategies, and outcomes operate within two interrelated contexts, namely the institutional context and the vulnerability context. Mountain households are characterised by a diverse portfolio of livelihood activities and income sources. This reflects how mountain households construct an increasingly diverse portfolio of activities and assets in order to survive, cope with, and improve their standard of living. History shows that mountain people cope with crises using their own resources and go to great lengths to protect their livelihoods. This has, however, become increasingly difficult in mountain areas due to a shrinking natural resource base, increasing population pressure, and a low level of development. While inaccessibility, fragility, and marginality accentuate vulnerabilities in mountain areas and affect livelihoods, mountain niches and diversity, the other two mountain specificities, provide scope for the mitigation of vulnerabilities to improve the livelihood of mountain people (ICIMOD 2003b).

A typical farm household in the mountains is involved in multiple activities, both farm-based and non-farm based. Seasonal migration is becoming an integral part of this livelihood strategy for many mountain households. While migration has benefited households in some ways, it has placed an additional work burden on women.

Another important livelihood option is being provided by mountain tourism. As many mountain areas are endowed with natural assets that attract tourists, tourism is becoming an important livelihood activity for mountain people. However, there are risks associated with tourism.

In addition, non-timber forest products (NTFPs) and in particular, medical and aromatic plants, have a great potential to increase cash economies and markets within and between the countries of the HKH region and beyond. The HKH also offers an array of nature and adventure tourism based on the region's great biological wealth and rich ethnic diversity.

Harnessing mountain niches and linking them to markets can provide new livelihood opportunities and reduce the high dependence of mountain people on degraded land, forests, and pastures, and provide incentives for their conservation. An example of harnessing a niche is the conservation of the indigenous honeybees of the Himalayas – *Apis cerana*. Research work on honeybees is ongoing, but the lessons learned so far indicate that bees can provide supplementary income to poor mountain households. The programme is ongoing in Nepal, India, Pakistan, and China. Besides perfecting the selection process of *Apis cerana*, new commercial products (honey, beeswax, and beeswax-based beauty and healing products) are providing new livelihood options to mountain people. Research results indicate that pollination services can enhance crop productivity by 20-30%, while also contributing to biodiversity.

## **Renewing the resource base**

Natural resources should be left to a community-based management system in which the stakeholders and users are the central actors. Experience shows that community managed systems can increase mountain productivity, food security, and biological sustainability. ICIMOD has been promoting such programmes through participatory forest management. Joint forest management in India and community forestry and leasehold forestry in Nepal are good examples of participatory forest management that have led to the successful regeneration of degraded forests and have helped promote biodiversity and conservation.

In Nepal, over 16% of the total forest area is managed by community forestry. The community forest user groups have expanded managed forest areas to almost barren slopes. This is a significant achievement; because without forests the majority of Nepal's rich biodiversity would be lost. Community forestry has also contributed to preventing the local extinction of species, the creation of habitat corridors, and the development of successive stages of forests. Wildlife sightings have increased, but so have livestock depredation and damage to fields by wildlife. Leasehold forestry is also contributing to forest development. Mountains are becoming greener, degradation is gradually being reduced, areas are protected, and biological diversity is slowly recovering. The key to this success story has been the sharing not only of management responsibilities, but also of profits with local communities (Sharma 2004).



## **Hazard mitigation**

There are a plethora of problems in the HKH region – a low level of development, endemic and persistent poverty, rising population pressure, increasing resource scarcity, natural resource degradation, and the unsustainability of present patterns of resource use (Banskota et al. 2000). Six of the world's largest rivers – the Indus, Ganges, Brahmaputra, Mekong, Yangtze, and Yellow River originate in the HKH. These rivers not only sustain agriculture, livestock, household needs, industry, energy, and navigation but also support all biological life in the mountains. At the same time, mountain people are also the primary victims of environmental hazards such as floods, landslides, and snow disasters, which have been accentuated by deforestation and global warming. To address these issues, ICIMOD is seeking to improve regional cooperation on environmental services and hazard mitigation to reduce the physical vulnerability and increase the environmental security of mountain people and the downstream poor. The Centre mainly focuses on promoting regional cooperation and strengthening networks. Two major challenges are the collection of the necessary high quality hydro-meteorological data in all parts of the major river basins, including remote areas with limited infrastructure, and facilitating a system for the exchange of this data in real time between the countries through which each river runs to enable adequate lead time (ICIMOD 2003). This endeavour will provide greater security to livelihoods, property, and infrastructure in the region.

## **Decentralisation and empowerment**

Decentralisation and the empowerment of local institutions and people can help vulnerable mountain people by enhancing social security and reducing conflict, as well as by promoting gender mainstreaming and respect for equity and rights. To promote decentralisation, ICIMOD has conducted over 15 case studies and developed over 20 civil society organisations. The fundamentals behind the decentralisation programme are strengthening and promoting civil society networks so that communities and people can claim their rights. Federations such as FECOFUN and HIMAWANTI (Himalayan Grassroots Women's Natural Resource Management Association) are community-based institutions of this type developed in a professional way to generate demand for power from the bottom level so that this demand is heard at the central or higher level.

FECOFUN, founded in 1995, is one type of community network – a national association for community forestry user groups in Nepal. Its mission is to safeguard the natural and legal rights of forest users, to inculcate self-reliance, and to increase the decision-making capacity of forest user groups. FECOFUN has made everyone realise how community forestry in Nepal exemplifies a unique and successful case: users, given the appropriate policy and legal environment, can organise themselves collectively and manage natural resources.

Likewise, HIMAWANTI is another exemplary independent, non-government organisation mandated to strengthen and promote the role of grassroots women in sustainable natural resource management in the countries of the HKH. Women from Nepal, India, and Pakistan formed a regional women's community forest user group network in December 1995 with the aim of identifying the problems experienced by women's user

groups and evolving strategies for the future, especially the institutional mechanism for the network. The mission of HIMAWANTI was to ensure the emergence of appropriate policies and decision-making processes in relation to programmes aimed at organising rural women and promoting their moral strength for the conservation and management of the natural resources of the HKH by giving them priority. In October 1999, after more than two years of planning and preparation, HIMAWANTI succeeded in bringing together more than 200 women from the region to a workshop, supported by ICIMOD, entitled 'Focus on Grassroots Women in Natural Resources Management in the HKH'. The aim was to provide a forum for grassroots women to share their experiences, evolve strategies, and to strengthen communication and alliances among the rural women who are actually involved in conserving and managing natural resources.

## **Policy dialogue**

The policy process in the Hindu Kush-Himalayan region needs to be cognisant of the appropriateness of policies for mountain regions. ICIMOD has pioneered the shaping of mountain policies and has advocated for recognition of the parameters of vulnerability, marginality, fragility, and inaccessibility as specific mountain conditions. ICIMOD conceived and promoted the 'mountain perspective framework' and its application to formulating mountain-specific policies in the Regional Member Countries. Its leadership role in this area is widely recognised. ICIMOD has pursued policy advocacy work using thematic windows and identified cross-cutting issues with respect to food security, mountain agriculture, highland-lowland economic links, and the effectiveness of participatory natural resource management. ICIMOD's programme on policy development and advocacy support has positively influenced national policies and strategies and the allocation of resources in favour of mountain people and areas. ICIMOD has established a system for engaging in policy dialogue with the Regional Member Countries to identify critical policy gaps and viable alternatives and options. Likewise, ICIMOD is duly working on partnership development at different levels of involvement with 60 major regional partners and 200 collaborating organisations inside and outside the region. Developing regional partnerships has been the main thrust of the Centre since 2003.

## **The way forward**

Although the problems and challenges faced by the Hindu Kush-Himalayan region are multifaceted and complex, various initiatives clearly indicate that the challenges are surmountable. First and foremost, the policy-making process must be relevant and responsive to the needs and the challenges of mountain areas. Second, the nexus between poverty and environmental sustainability must be recognised and the poor and the community be made the central actors. Third, institutions like ICIMOD can be used maximally to strengthen partnerships and enhance capacity for collaboration in planning, achieving, and monitoring programme activities. Fourth, a giant step has to be taken in order to make mountain information and knowledge accessible and usable by partners, policy makers, advocates, and development practitioners. Finally, in order to achieve the above and much more, ICIMOD has to be supported and made sustainable in order to make these results deliverable.

If the past has been challenging, to say the least, then the future is even more daunting. Given the changes seen in mountain areas, as well as the changes in the global development scene, how can ICIMOD adapt and respond, so that it is not only well grounded in these mountains but at the same time relevant internationally? Just as people discover the mountains only during their holidays or at times of disaster, there is always a danger that ICIMOD is also only an 'occasional discovery'. To avoid this ICIMOD must become more relevant to the countries, to their national policy makers, to the region, to the world, and to their key players. During the past two decades, many national and regional institutions have come up. The links made with Consultative Group on International Agricultural Research (CGIAR) centres have been quite limited. There is a need for ICIMOD to work together with these centres. The utility of ICIMOD to countries is what it can offer. With many of the mountain areas catching up in the information age (here ICIMOD has made a major contribution in the past) the future holds even greater promises to bring more useful knowledge to the doorsteps of mountain people.

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## Panel Topic – Sustainable Rural Development in Mountain Regions – Lessons from the Tibet Autonomous Region of China

*Dr Nyima Tashi, Vice President, Tibetan Academy of Agricultural and Animal Husbandry Sciences (TAAAS)*

Mr Chairman, Your Excellencies, Ladies and Gentlemen, as a member of ICIMOD's alumni, I feel greatly honoured to have this opportunity to share with you my experiences and views on mountain development. The Tibet Autonomous Region of China occupies a large area of the Hindu Kush-Himalayas and is therefore a key constituent of ICIMOD's area. As we have already heard many times in the past few days that mountains have unique environments generally characterised by harsh climatic conditions, fragile landscapes, clean water, and fresh air, I will not dwell on these aspects. However, let me re-emphasise the fact that mountain areas are socioeconomically weaker than the plains and coastal areas. While much progress has

been made through the support of the central and provincial governments as well as donor agencies and NGOs, there is still much that needs to be done to alleviate poverty, enhance the general living standards of mountain people, and increase their income.

There is now a general consensus that poverty in rural mountains is manifested in low income earning opportunities, inadequate access to nutritionally balanced food, inadequate access to safe drinking water and energy, low literacy rates, poor health, and weak social and economic support services and infrastructure. Given such environmental and socioeconomic conditions, mountain areas face many challenges, but also enjoy some niche opportunities. Hence, coping strategies leading to sustainable development entail a balanced and integrated approach to address the challenges and realise the niche opportunities.

It is also apparent that there are significant disparities throughout the region between urban and rural areas in terms of living standards, income levels, and access to goods and services. In the Tibet Autonomous Region, the government has initiated some very forward looking measures, such as the village level development plans adopted under the county poverty alleviation planning methodology using a participatory approach.

It is now widely acknowledged that globalisation and the free market have opened up many new opportunities for income generation, as well as presenting new challenges. Our ability to harness these perceived benefits will, however, depend upon how well we use the comparative advantages offered by the pristine environment of the mountains and the unique culture and traditions of mountain people by exploiting niche markets for products and services such as organic food products and eco-tourism. The main factors constraining participation in the market economy are lack of economies of scale, poor quality, inaccessibility to markets and market information, lack of an enabling policy environment, inadequate investment in processing facilities, and rather weak marketing skills and entrepreneurship spirit.

In order to overcome the above constraints, we need to carry out a systematic poverty assessment exercise, based on existing data and further surveys, so that we can better target the poor and marginalised households and communities, using a participatory development planning approach. Based on the results of this poverty assessment, a poverty alleviation plan should be formulated for different economic and ecological regions. The plan should focus on improving social infrastructure and the livelihoods of the rural poor, and aim to provide better social services such as education, drinking water supply, health clinics, and agricultural and livestock production services. Due emphasis should also be placed on the promotion of alternative sources of energy, communication, and transportation facilities. There must be a concentrated effort to further strengthen and accelerate the adoption of participatory planning and the implementation of rural development programmes by scaling up the poverty alleviation planning methodology, and by building the capacity of government officials in participatory planning and management approaches through a focused training programme.

In mountain areas, it is particularly important to adopt an integrated approach to rural development planning and implementation through the involvement of all stakeholders, including government agencies and local institutions, and by improving cross-sectoral cooperation and coordination.

To increase the income of mountain people, there is an urgent need to assess and promote niche opportunities and the comparative advantages of different areas of income generation from both farm and non-farm sources, for example, the integration of organic food production into the pastoral and farming production system. This process should be supported by institutions, such as cooperative organisations, with the assistance of the government and private sector companies, to add value through the establishment of processing facilities for identified niches. Of course, it goes without saying that an enabling policy environment should be in place to encourage private sector involvement by reducing procedural bottlenecks in production and marketing, and to actively facilitate the promotion of trade and commerce by creating an improved investment climate.

Another important area, which needs urgent attention, is vocational training in various fields, from traditional to modern. Vocational training will help to create employment opportunities and non-farm income generating opportunities and will help adjust learning curricula to meet market demands. This, together with the capacity building of policy makers and planners to be more responsive to the special development needs of mountain areas, should help to mitigate the number of migrants from rural to urban areas.

These are my comments and suggestions for the promotion of sustainable development in mountain areas. I hope that this Symposium will come up with valuable recommendations to help us to refine our policies, development programmes, research, and extension systems, so that they are more responsive and relevant to mountain people and their ecosystems.

Finally, let me, on behalf of my General President, Professor Lobsang Danda and TAAAS, join with all of the others in congratulating ICIMOD for its successful move to its own home.

Tashi Delek!

# **Panel Topic – Poverty and Environmental Linkages, the Relationship between the Environment, Poverty, and Gender**

*Dr Rob Visser, Ministry of Foreign Affairs (DSI), Government of The Netherlands*

## **The close connection between the environment, poverty, and gender**

It is generally accepted that there are close ties between poverty and the environmental situation. In practise, poverty can be the cause, as well as the effect, of environmental problems.

Poverty can cause environmental problems. Sometimes the poor apply short-term strategies for survival out of necessity, or because long-term strategies are of no interest to them due to precarious or obscure land rights. Mainly in developing countries, the poor are increasingly dependent on natural resources for their basic necessities of life, such as food and energy. Consideration for the environment or a sensible conservancy is often not an option. It goes without saying that these two factors are of vital consequence in mountainous countries. What applies to the poor is also true in general for poor national governments. The emphasis lies on the realisation of quick economic growth and the expenses of conservation are considered a luxury.

Poverty is also an effect of environmental problems. The poor often rely upon ecologically marginal areas characterised by low productivity, high vulnerability, and livelihood risks. As a result of this, and their dependability, poor communities are disproportionately hard hit by negative environmental problems. Their capacity to avoid, endure, or absorb negative effects is limited. They lack the financial means to employ alternatives, like using butane gas instead of scarce firewood, or fertiliser for declining yields due to soil exhaustion. Again, it goes without saying, that these three factors are of vital consequence in mountainous areas.

The poor fall into a vicious cycle of poverty and environmental degradation. Cause and effect are so intricately interwoven that they cannot escape from this so called 'poverty trap' by themselves.

The relationship between women and the environment has received a lot of attention since the beginning of the 1980s. In Nairobi, in 1985, the National World Women Conference brought both topics together on a policy level for the first time. For years, many publications have pointed out the responsibilities, activities, and authority of women in connection with the use and management of natural resources. In view of the responsibility women have for production (agriculture, livestock industry, and gathering water and firewood) as well as for consumption (choice of products, waste disposal) women are clearly important users and consumers of the environment. Environmental activities that do not take the (gender-) diversity and interests of the concerned target group into account run the risk of failing.

## **The context of the connection between the environment, poverty, and gender**

The connection between the environment, poverty, and gender is very context specific. It is a connection that differs with every ecosystem. Is there anything that can be said in general about this connection? Yes, but only in very general terms. This, for instance, has happened in the so called OECD DAC system (Organisation for Economic Co-operation and Development, Development Assistance Committee) which states that the connection between the environment, gender, and poverty always depends upon economic, political, and social factors and also has to do with the vulnerable position of the poor and their social status. That these five factors are crucial for the connection between the environment, poverty, and gender speaks for itself. However, it remains imperative to emphasise the context. The fact that there is an obvious analytical relationship between the environment, poverty, and gender does not mean that there is a clear-cut relationship between environment policy and poverty and gender policy. On the contrary, this is where environmentalists make their gravest error. They have the urge to deal with environmental problems using environmental measures. This can be prevented by the realisation that the relationship between the environment, gender, and poverty is dependent upon other contextual factors. If environmental degradation is a consequence of the bad economic policies of a government, which is sometimes the case, then economic policy is the key to improvement. In this case environmental measures to prevent degradation could even become 'symptom treatment'. If environmental degradation is caused by what Homer-Dixon calls 'resource capture', which is common along with other political factors, then these political phenomena would be the key to tackling environmental degradation, and interventions for better conservancy would become symptom treatment. If environmental degradation is a consequence of bad governance, which is quite often the case, then good governance is the key to improvement.

## **The most recent ideas on linking poverty reduction and environmental management**

The most recent notions linking poverty reduction and environmental management are summarised in a concise publication by the UK Department for International Development, the European Commission, UNDP, and the World Bank (2002), based on an extensive e-mail discussion with more than 1000 participants from 84 countries.

As far as analysis of the connection between the environment and poverty goes, there are no new arguments. As is usually the case in most of these documents, gender is treated in a separate paragraph and without an adequate analysis. Due to insufficient accountability in the donor world, when it comes to gender oriented work, authors regrettably aren't put in the pillory by their organisations.

However, the guidelines for policy opportunities are worth positive recognition. (Even if only to emphasise once more that they, by definition, are incomplete and superficial because of the lack of focus on gender.) Here follows a summary of the four central policy highlights from the report:



- improving governance – among others: integrate poverty-environment issues into national development; empower civil society; address gender-dimensions (as a separate sub issue); strengthen anti-corruption efforts; reduce environment-related conflict
- enhancing the assets of the poor – among others: improve resource rights; access to environmentally sound and locally appropriate technology; reduce environmental vulnerability
- improving the quality of growth – among others: integrate poverty-environment issues into economic policy reforms; encourage appropriate private sector involvement in pro-poor environmental management; implement pro-poor fiscal reforms
- reforming international and industrial country policies – among others: more pro-poor and pro-environment trade policies and foreign investment; encourage sustainable consumption and production

Some remarks follow about these points, which are seen as the core challenges on the agenda. It is remarkable that some new notions of poverty prevention are well portrayed in the agenda. It is emphasised that the poor are not passive victims, there is a shift towards the macro level, and there is talk of a broadening of relevant factors (tax for example) and actors (the private sector for example). Interestingly enough, there is still an emphasis on governance, which through the years has become a greater centre of attention for donors. Among the positive points in an assessment, it needs to be said that there is an increasingly integral vision of environment.

However, there are also critical notes. First of all, the already mentioned marginal, instead of central, attention to gender. Secondly, the apolitical character of the analysis. For example, governance is not a politically neutral technical management assignment; the basis for governance is culture, politics, and institutions. Finally, the last note of criticism, namely the lack of attention to institutions. One does not need a lot of empirical experience to realise that, specifically with the relationship between environment, poverty, and gender, formal organisations, mandates, and targets only touch upon a part of reality, and a very small part at that.

All in all the notions of the donors about the connection between the environment, poverty, and gender convey positive points, but for more meaningful interventions it is necessary to look at the political aspects and institutions.

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## **Panel Topic – New Opportunities for Mountain Economies**

*Dr Kamal Banskota, Programme Manager, ARID, ICIMOD*

### **Background**

Opportunities do not come by chance. They are created and facilitated by man-made and natural capital, infrastructures and technologies, the biophysical conditions that characterise mountain areas, human resource development, institutions, and an appropriate policy environment. Here we refer to economic opportunities only, meaning a set of favourable circumstances that help employment and income generation through a qualitative or quantitative increase in production, consumption, and exchange that enhances the livelihoods of mountain people. Such opportunities also arise through the conservation of natural resources. Economic opportunities arise when value is added to old activities (goods or services) or new products and services for sale in the markets.

Opportunities could be internal within the mountains, or external to mountain areas. Mountain niches, natural resource management, and the application of technologies or new methods of production or exchange could generate employment and income opportunities in the mountains. The migration of cheap labour to urban centres, within the country or outside, also provides employment opportunities to mountain people. Harnessing mountain resources for hydropower and tourism development has generated opportunities in the mountains. The development of urban centres in mountain areas creates a demand for fresh vegetables, milk, fruit, and others, which mountain communities can fill.

Unfavourable policies have hindered the creation of opportunities in mountain areas despite the potential. Urban areas and lowlands have generally treated mountain areas as their hinterlands and a source of raw materials. Over time, this has led to the selective extraction of some raw materials from mountain areas. Mountain people have generally not received fair prices for their products due to constraints imposed by the poor mobility of people and their products; the perishable nature of mountain products; and the low bargaining power of the unorganised and scattered markets in mountain areas, as well as the overall inaccessibility of the HKH. The result has been the underpricing of highland resources, products, and services; concomitant structural and operational inequalities; and the creation of negligible economic opportunities for mountain people in their mountain homes.

Despite the large potential opportunities, there are formidable barriers as well. The challenge lies in removing these obstacles. These obstacles relate to policies, institutions, human capacities, physical access, communications, markets, and incentives for outsiders to invest in mountain areas. Attempting to identify and list all of the emerging opportunities in the HKH region is a vast topic and beyond the scope of this paper. This paper only touches the surface of some of the emerging opportunities in the HKH.

## Emerging opportunities

### Improving physical access

Limited accessibility due to terrain and altitude is the single largest constraint on the generation of opportunities in mountain areas. Improved access (roads, ropeways, bridges, trails) enhances physical accessibility, inclusion (as opposed to isolation), communication, and mobility, and reduces transportation costs, all of which, besides directly benefiting mountain communities, help harness the many new opportunities in mountain areas. The lack of physical accessibility severely limits access to markets for many mountain products and resources, as well as the harnessing of niches. The poor access situation also prevents the delivery of many development inputs and services from reaching mountain communities. As a result, marketable surpluses and many mountain niche resources have remained grossly under utilised and under valued. However, given the acute poverty that characterises large parts of the HKH, simply constructing roads and other infrastructure is unlikely to generate new opportunities. Roads and infrastructure must be followed by complementary investment that enhances local production and harnesses mountain niches. Throughout mountain areas, the development of roads has been an important factor in generating new opportunities for mountain people.

Besides roads, gravity ropeway technology helps to mitigate inaccessibility in mountain areas and has the potential to add value to existing roads given that many settlements in the mountains are far from them. Gravity ropeways offer massive time-savings in transport and savings in labour and drudgery, particularly where the transportation of bulky items is concerned.

#### Examples

- In Himachal Pradesh (HP), India, roads have been a primary factor responsible for horticultural development in the state. Over time, the large network of roads has made HP a successful mountain state, able to produce a variety of niche products based on market demand. While 30 years ago HP specialised in horticultural production (primarily apples), it has now been able to diversify into cut flowers and vegetables to meet the insatiable demand of the lowland urban centres. This dynamic growth has created employment and income opportunities not only for the people of HP, but for people outside the state as well (Bihar and Nepal).
- A study by the International Food Policy Research Institute (IFPRI) attributed investment in roads as the single most important factor contributing to poverty alleviation in India (Fan, Hazell, and Thorat 1999).
- Over 50% of the Kathmandu valley's vegetable demand is met by vegetables supplied by neighbouring districts due to improved road access (Bhandari, Banskota, and Sharma 1999).
- In west Nepal the construction of mule trails increased the flow of milk, fruit, and vegetables from villages that were long distances from the road head, to market centres such as Baglung and Pokhara (RCIW 1999).
- In the mountain areas of Pakistan, roads have had the single largest impact on rural livelihoods by increasing the stock of their productive asset (land) and by increasing the mobility of goods and services to and from villages (Malik 2004).

- An Asian Development Bank study shows a strong connection between infrastructure (roads, irrigation, and electricity) and poverty reduction in developing countries (Nepal, China, Indonesia, Philippines) when road investment is complemented by other investment such as strengthening of governance and institutional frameworks (Ali and Pernia 2003).
- In Danogi village HP, with gravity ropeways, people have been able to transport goods to and from villages at a cheaper rate and in a shorter time. Due to improved access to markets, almost 90% of the land is being used for mixed cropping of apples and vegetables in place of food grain. Village people report that men have more time to share the agricultural workload with women and to grow vegetables.
- In the village of Marpha in Mustang district, Nepal, the construction of a gravity ropeway has reduced the travel time for carrying apples from orchards from about two hours to two minutes. Apples reach the market in a fresher condition and fetch higher prices. The price of inputs has reportedly been reduced. The ropeway has also reduced the drudgery of carrying heavy loads on human backs.

## Access to improved technology

Technology helps to improve livelihoods by raising productivity, improving product quality and diversity, reducing the cost of raw materials, and reducing energy requirements, leading to increased sales and income. Technology also improves livelihoods by developing the capability, within farm and non-farm sectors and supporting institutions, to respond to changing needs and opportunities as they arise. Technology plays a key role in generating new opportunities.

### Examples

- In rural areas of the HKH, women spend a considerable amount of time on water and energy related activities, which are also associated with a high level of drudgery. Through needs-based water and energy technology interventions, women have been able to save time in water and energy related activities and reduce drudgery. With training and exposure to different technologies, this saved time has helped women to generate income from diverse activities. Technologies selected and used by women (in Nepal, India, and Bhutan) include sprinkler and drip irrigation and water harvesting technologies, vermicomposting, tailoring, beekeeping, door-to-door service to construct improved cooking stoves, managing an LPG (liquid petroleum gas) depot, and production and sale of solar dryers.
- The introduction of triticale (*Triticale hexaploide*, a stabilised hybrid of wheat and rye) in Mustang has shown higher productivity (both grain as well as straw) than traditional barley. The crop is fast growing, requires a shorter season than barley, and less water and nutrients. Triticale also produces more straw and hence contributes to more livestock output. In Bhutan, local farmers have found triticale (introduced from Switzerland) to be better suited for food purposes than local wheat and barley (ICIMOD 2004).
- Mountain people are now able to cultivate different varieties of carp fish for their own consumption as well for market. This is possible because of the development of cheap ponds suitable for mountain areas. Such ponds have been able to earn as much as Rs 24,000 in a season in Kausani, India (ICIMOD 2004).

## Markets

Markets play a significant role in realising economic opportunities for the poor. Access to markets has enabled many mountain communities to produce according to the comparative advantages of their region. Markets can influence diversification from traditional crops to market demand led production.

Apart from conventional agricultural products, the rich biodiversity of the mountains of the HKH opens up scope for the marketing of many niche products and services internationally. Also growing is the market for environmentally friendly traded products. Organic, eco-labelling, and other forms of certification are market-based tools that enable consumers to differentiate between products based on their social and environmental qualities. This market opportunity has been a driving force in promoting sustainable management practices in both forestry and agricultural products worldwide. A certification logo enables consumers to choose between products based on the social and environmental impact of the production, harvesting, and processing of the product (Pierce et al. 2003).

Certification can also result in the implementation of long-term management plans and internal control systems such as monitoring and record keeping, as well as facilitating access to niche markets; it also reduces the pressure of increased market demand and its negative effect on the environment. The current system is affected by illegal trading and the adulteration of many mountain products, especially non-timber forest products (NTFPs); the certification system can ensure that the 'chains of custody' for NTFPs comply with norms and standards. As market pressure is a leading factor in unsustainable and unethical practices, making the markets work for the poor is an essential strategy to make business more responsible to environmental concerns and the livelihoods of local communities in the mountain regions of the HKH.

Certified products receive a premium price over non-certified ones, provided that markets for the products exist. Mountain regions have an advantage in this sector as the use of external chemical inputs has been minimal. This has substantially reduced the conversion period required for certification. There is also huge scope to transfer a significant portion of the profits earned from products traded internationally to rural producers through fair trade mechanisms.

These concepts are creating new opportunities for many countries in the HKH to tap into the huge market in the emerging globalised world. Where these potentials are being tapped, mountain people have been able to realise better incomes than previously realised from traditional practices.

### Examples

- Vegetable farming in and near the Kathmandu valley in Nepal.
- In Bhutan, the sale of off-season potatoes and vegetables to downstream markets in India and Bangladesh fetches an annual export earning of about US 4 million (Gyamtsho 2004).

- Off-season pea cultivation and potato seed production in remote arid regions of Lahaul and Spiti in Himachal Pradesh in India benefits many poor farmers who previously had to rely on subsistence farming.
- Growing and selling specialised crops that are in demand by the private sector in the plains for specialised consumer items, e.g., the cultivation and processing of hops by communities in Lahaul for the huge beer industry.
- Poor farmers in Bhutan have been able to earn an average of US \$1086 per season from the sale of matsutake mushroom to Japan (Gyamtscho 2004).
- The increasing market growth for herbal and natural products from the Himalayas is a promising example. The final consumers for many of these products are in distant markets in the West that are growing. Conservative estimates put the monetary value of medicinal and aromatic plants related global trade at around US \$63 billion (IDRC/MAPPA 2004).
- Many mountain states in India have declared, or are in the process of declaring, themselves as 'organic' e.g., Uttarakhand, Sikkim, and Mizoram.
- Some of the work being done by ICIMOD has helped to create new opportunities in fragile environments. The indigenous honeybee (*Apis cerana*) programme by ICIMOD has been able to achieve mass queen rearing and 'nucs' marketing. Private small-scale businesses in Pokhara have begun to emerge providing new sources of income without disturbing the environment. The other advantage is that mass queen rearing over time will help pollination services.
- High value medicinal and aromatic plants are often found in fragile areas. The managed harvesting of these products enhances livelihood opportunities in mountain areas. Seven high value medicinal and aromatic plants have been tested successfully at test and demonstration sites in remote areas such as Humla and Jumla in Nepal. With a buy-back policy supported by the government, new opportunities to generate income and employment have been provided. Some high value products such as *Tricholoma matsutake* and *Cordyceps sinensis* (yarcha gunbu) found in very fragile high altitude regions have traditionally been extracted and illegally exported. In Bhutan, ICIMOD is testing the feasibility of allowing local communities to harvest these products. If the communities can sell the products legally at market rates, there is the potential to generate income in some of the most remote areas of the HKH. There is scope to replicate this in Nepal also where *Cordyceps sinensis* is found.

## Natural resource management

Mountain areas are highly diverse in terms of renewable natural resources and environmental services. Diversity helps to reduce internal competition in mountain areas. While fragility accentuates vulnerability in the mountains, diversity can partially offset vulnerability. The biodiversity found in mountain areas has value in agriculture, medicine, food, and industry, as well as having spiritual, cultural, aesthetic, and recreational value. The ecosystem services provided include pollination, nutrient cycling, soil maintenance, and climate regulation. If managed properly, such resources provide many opportunities for mountain people. Where concerted efforts have been made, mountain niches are providing new opportunities.

However, many of the ecosystem services that provide sink functions, such as the purification of water and air, the detoxification and decomposition of waste, regulation of climate, regeneration of soil fertility, and the production and maintenance of biodiversity are only beginning to be appreciated. However, because these benefits are not traded in the markets, they do not carry any price that would provide scarcity signals to society. The threats to these systems are increasing, especially in mountain areas. There is a need to start valuing these ecosystem services at the micro level, where they are generated, and incorporate them into the decision-making process.

### Examples

- Mountain tourism has been able to provide income and employment opportunities to marginalised communities in many inaccessible and fragile areas. Mountain tourism is one product that appears to overcome the vulnerability dimensions of inaccessibility, fragility, and marginality, while at the same time capitalising on the niche and diversity specificities of the mountains. Although tourism is an export product, it need not be physically exported, and those who want to enjoy it must visit the place. The diversity of mountain areas is reflected in the multitude of tourism destinations and different products often found in fragile landscapes that visitors can enjoy, each of which is unique. As visitors have to visit the site, inaccessibility is not a prime deterrent. Mountain tourism, by and large, benefits marginalised communities in most mountain areas. The potential to generate additional employment and income opportunities in mountain areas through tourism is high.
- Bee watch tourism is being developed to provide new opportunities in some marginalised mountain communities, to reduce drudgery, and promote the conservation of ‘cliff bees’ in the Himalayas. Harvesting honey was a source of income for marginalised communities residing near cliff bee habitats, however harvesting methods were not conducive to conservation. Bee watch tourism will generate funds by allowing tourists to observe the nesting habitats of cliff bees. Not only is the conservation of the cliff bees promoted, but the livelihoods of marginalised communities are also enhanced.

## Enabling environment

Mainstream development approaches, strategies, and policies have little relevance in generating new opportunities in mountain areas. An enabling policy environment needs to be created to generate and sustain opportunities in mountain areas by mitigating the influence of vulnerability and by harnessing mountain niches, diversity, and human adaptation skills.

Despite all the rhetoric of development and significant development expenditure, mountain people continue to be marginalised. The role of the government is primarily to facilitate. Governments can systematically develop the opportunities available in the mountains by creating enabling conditions that favour economic expansion. Highlighted below are some critical elements of an enabling policy environment that creates and sustains economic opportunities and confronts the existing barriers in mountain areas.



## **Area-wise focused development approach**

An area-wise focused development approach in mountain areas is likely to be more effective than a broad-based household targeting approach, given the isolation and geographical exclusion of mountain areas that requires an integrated rural accessibility planning approach (IFRTD 1998; Papola 2001). This calls for delineation of an area using spatial methodology, like GIS, on the basis of a watershed approach, while at the same developing rural-urban linkages with the ultimate aim of graduating from a watershed to a market-shed approach (Papola 1996; Sharma 2002).

## **Promoting decentralised planning and control processes**

Promoting decentralised planning and control processes within agencies and governments and the involvement of the community are prerequisites for effective conservation and sustainable development in mountain regions. Ways and means have to be explored to overcome the problems and difficulties involved in decentralisation and participation arising from centralisation, internal power conflicts, and bureaucratic hassle, including policy and legal barriers.

The central goal of mountain development should be the strengthening of human resources (education, health, and productivity) and the breaking down of barriers that prevent men and women from fully developing their ability to create economic opportunity and growth.

## **Information and communication technology**

Information and communication technology offers new opportunities to access information on emerging technologies and markets in more effective ways. This enables mountain people to take advantage of the poverty reducing opportunities offered by new technology and the marketing of their products. The potential for information and communication technologies to widen access is important, as it may compensate for the constraints imposed by poor linkages. Ways and means need to be explored to utilise the opportunities provided by such technologies on a wider scale for the benefit of mountain people.

## **Ensuring good governance**

Ensuring good governance is most essential to generate and sustain opportunities in mountain areas. Despite the current emphasis on greater reliance on markets for development and poverty alleviation, the central role of governments cannot be undermined. This is especially true in mountain areas, where the state should continue to invest in infrastructure and services, and evolve conducive policies in favour of mountain areas to ensure that markets function better and that the risks and effects of market failures are minimised. Investment by governments in the development of mountain areas and for the welfare of mountain people needs to be seen as the price for environmental services rendered by them, rather than as subsidies in the conventional sense (Papola 2001).

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## Panel Topic – Mountain People, Economic Benefits, and Biodiversity

*Synopsis prepared from panel commentaries and presentations made by Dr Ruth Egger, Independent Board Member, ICIMOD*

### Introduction

The Hindu Kush-Himalayan (HKH) region is bestowed with a rich biodiversity that provides for several distinct products and services. More work has to be done and can be done to exploit these mountain niches to support income generation and contribute to the economic and social benefit of mountain people, especially women. To achieve success, this work has to be done professionally and strategically, and not just as a side activity. Various issues need to be addressed if the potential benefits are to be realised.

### The valuation of goods and services in the HKH

There are different approaches for developing niche products and ensuring valuation of goods and services.

#### *a. Identification of goods and services with a special attribute or value for the market*

This can be done through collection of information with regard to use, traditional practices, and market values of different biological resources. Building on the indigenous knowledge that already exists with the local people, products and services can be identified and their potential benefits further validated through scientific research. Investigations should include the identification and/or development of suitable technologies for sustainable utilisation of the resources required, as well as the search for markets for the products and services.

Examples of such goods and services produced in the region that have been identified as having a special value for a wide range of markets are medicinal and aromatic plants, ecotourism, and Nepali paper.

#### *b. Rejuvenation and improvement of traditional crops for national consumption*

There is a growing market for foods from indigenous crops, which are associated with high nutritional values and having medicinal properties. This opportunity needs to be harnessed by documenting and validating the specific nutritional and medicinal values of traditional crops, by improving the processing and the packaging to suit the demands of urban consumers, and for promotion in urban and national markets. The aim is to reduce imports of costly and often less nutritious food crops from abroad.

A good example of such a crop is finger millet. It enjoys the reputation of a healthy food. Processing and repackaging this crop in a way that makes it more attractive to the urban population, and propagating its nutritional value to consumers, can greatly enhance its use. Other examples include potatoes and buckwheat. Buckwheat had not been grown in the mountains of Europe for some time, but now there is a resurgence of cultivation in mountain areas due to its nutritional value and appreciation for biodiversity. Similarly, potatoes can be promoted in urban markets as mountain potatoes have a very different taste to lowland potatoes.

*c. Improvement of production and harvesting methods of high-value products in an ecologically sustainable way*

There is a need to conduct research on ways of improving the production and harvesting methods of mountain products and to establish demonstration plots to promote these improved technologies among producers. Dissemination of information relating to production and processing as well as training should be provided to producers and retailers.

A good example of how intensified research and management can enhance productivity and sustainability of a niche mountain product is lapsi. Lapsi has two kinds of trees, male and female. If more research is undertaken to help identify male and female trees at an early stage, a higher proportion of fruit bearing female lapsi trees could be cultivated. This would make the cultivation of lapsi more attractive to mountain farmers and increase production as lapsi has a good market locally and in the surrounding region. Another example is pine kernels, which are produced in the Swat area of Pakistan and have a good market in Europe if they are properly collected and preserved.

## **Prerequisites for success in realising the potential benefits from mountain goods and services**

*a. Framework conditions*

For a certain product to be successful in the market, it is important that the producers, primarily smallholder farmers, have user rights to or ownership of the resource base from which the raw materials for the products are derived. The producers should also have easy access to information, technology and markets.

*b. Support from the local authorities*

If the markets are controlled by a few traders, it is difficult to enter as a newcomer and with new products. Therefore, it is important to engage local authorities in the promotion of a product and markets.

*c. Organisation of the community (collectors, producers, and processors)*

In order to be successful, a product has to reach a minimum quantity for sale (economy of scale). This often entails the pooling of resources and/or products from small producers to generate a viable quantity for marketing. In a market economy, quantity and standard quality are necessary to have an impact in the local economy and to sustain production and marketing. When organising the producers, the poorer and weaker members must be involved at the very early stages – once the market is developed the chance to involve them is limited as class hierarchy then plays a vital role. There needs to be a clear strategy from the beginning if we want to involve poor people and if they are to derive any economic benefits from participation in the value chain.

*d. Linkages to markets (to intermediaries or final buyers)*

A facilitator is needed to link the producers and product with the market. Markets should be looked at over time, and support should be extended to producers to

negotiate favourable business terms, and conditions and to ensure that all parties get a fair deal. People in villages are often not good at negotiating with buyers who come into the area, and are either cheated or unable to negotiate the best price for their goods. Facilitators (such as non-government organisations) can help people to negotiate and create an equal playing field for all so that everyone benefits (benefit-sharing).

*e. Entrepreneurial, businesslike behaviour from all partners involved*

For any business to be successful, a high degree of professionalism is required. Hence the development of entrepreneurial skills and attitudes among the various stakeholders involved in producing and marketing of the selected mountain products should be given high priority.

## **The role of ICIMOD**

ICIMOD can play an important role in the sustainable use and management of goods and services derived from mountain biological resources.

*a. Identification of goods and services*

ICIMOD can help in the identification of goods and services that have a high potential for accruing benefits to the mountain poor. This can be done through documentation of traditional knowledge and practices and through innovations for product development. A small change in productivity, quality or processing, and packaging of goods can make the difference in the market.

*b. Organisation of research and value chain analysis*

ICIMOD is already playing this role in relation to honeybees and medicinal herbs in Humla and Jumla. It should intensify its search for new products, and production and processing technologies, to enhance sustainability and quality of products and access to markets. People need to learn how to analyse markets and understand the supply and demand side, so that they do not depend on the sole intermediaries. To build up linkages, it is important to involve all stakeholders along the value chain from the beginning.

*c. Information, documentation, and propagation*

ICIMOD can do a great deal by identifying products with a high potential in different areas of the Hindu Kush-Himalayas, documenting information on their properties and uses, and disseminating this information widely.

*d. Mobilisation of NGOs and other actors*

As is already being done, ICIMOD can facilitate the organisation of farmers and communities into associations and producer groups, and provide training to them in production, marketing, and business management including financial services. For instance, providing training on financial management that emphasises the value of savings as a strategy to manage liquidity and risks would be highly beneficial for poor people.

#### *e. Advocacy and lobbying*

This role can be important for securing rights and equal access to resources among the producers and in resolution of conflicts and legal matters.

### **Perspectives**

Even though very few products have been discussed here, there is a considerable, yet under-utilised potential for mountain goods and services, especially for healthy and or high value products. What is needed now is for us to be ready to invest in conducting research, providing access to information, and promoting the framework conditions under which the potential benefits from such goods and services can be realised. Such efforts are necessary to maintain, and partly revive biodiversity in mountain areas, and above all, to improve the livelihood of the people in the Hindu Kush-Himalayas.

### **Discussion and Recommendations: Working Session III**

The plenary discussions after the presentations in Working Session III focused on the marketing problems of the Chittagong Hill Tracts and the realisation of the complementarity between the papers presented in the session. Accessibility has now been accepted as a critical factor in poverty alleviation, which was not the case two decades ago.

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 III are listed below.

- The following suggestions were made for promoting the securing of livelihoods for mountain people:
  - the policy-making process must be relevant and responsive to the needs of mountain areas
  - the nexus between poverty and environmental sustainability must be recognised
  - it is necessary to strengthen partnerships and collaboration in planning, achieving, and monitoring programmes
  - it is important to make mountain knowledge and information accessible and usable
- To develop and promote the potential of mountain goods and services, ICIMOD needs to initiate investment in research, information, and education, and in the women, men, and young people living in the mountains.
- Lessons and coping strategies leading to sustainable development entailing a balanced and integrated approach should be drawn from around the region. There is a need for systematic poverty assessment and poverty alleviation plans, as well as a need for the assessment and promotion of niche opportunities and the comparative advantages of different areas.
- A built-in alarm system should be developed to safeguard mountain societies from future negative impacts. A question was raised as to how remote areas could benefit from technological advances without losing their minority cultural identity.





**Session IV**  
**Strengthening Cooperation  
and Knowledge Sharing**

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*Chair: Dr J Gabriel Campbell*



# Keynote Paper – Strengthening Cooperation and Knowledge Sharing

*Lyonpo Dr Kinzang Dorji, Honourable Minister for Works and Human Settlement, Royal Government of Bhutan*

Mr Chairman, Distinguished Panel Members, Ladies and Gentlemen, let me extend my hearty congratulations to ICIMOD for the successful completion of their new headquarters and for organising this important international symposium that accentuates the reality of regional inter-dependence and cooperation in achieving sustainable development. The presence of so many eminent personalities from a wide spectrum of professional and institutional backgrounds bodes well for the future of ICIMOD.

Having had the privilege to serve on ICIMOD's Board of Governors from 1991 to 2000, it gives me great pleasure to join you and share my thoughts on the past as well as the future of this Centre. During my tenure as a Board Member, I not only saw ICIMOD's stature grow from year to year, but I also came to recognise its unique position and the challenges and opportunities that it has as the first mountain development centre focused on the Hindu Kush-Himalayan (HKH) region. I have witnessed the transition of two senior management teams during the period, from Dr Frank Tacke to Mr Egbert Pelinck in 1994, and from Mr Pelinck to Dr Gabriel Campbell in 1999. Incidentally, on both these occasions Bhutan happened to be the Chairman of the ICIMOD Board of Governors.

I have now moved to the Ministry of Works and Human Settlement, away from the Ministry of Agriculture, which continues to be the lead partner for ICIMOD in Bhutan and represented here by my colleague the Secretary of Agriculture, Dasho Sangay Thinley. However, my interest in ICIMOD and my assessment of its relevance to Bhutan have not diminished in the least. On the contrary, having to deal with building roads and settlements in the steep and fragile terrain of the country, I have begun to appreciate the relevance to us of ICIMOD's work such as mountain risk engineering even more. In Bhutan, we call it environmentally friendly road construction.

Mr Chairman, Ladies and Gentlemen, the topic that I have been asked to dwell upon – strengthening cooperation and knowledge sharing – lies at the core of ICIMOD's mandate. As already mentioned, the primary motivation behind ICIMOD's creation was to foster regional cooperation by facilitating the sharing of information and knowledge and the exchange of scientific know-how and technical expertise in mountain development among its member countries – in essence, working hand-in-hand to address our common challenges and objectives.

This mandate has become even more relevant today than it was twenty years ago. With the challenges as well as opportunities ushered in by global warming and climate change, by globalisation of trade and the free market economy, cooperation at all levels

– local, bilateral, regional, and global – has indeed become a necessity rather than a matter of choice. These changes are the stark reality and the critical issue is how we concertedly manage these forces. Without cooperation, we cannot expect to effectively face up to the challenges, nor to realise the opportunities brought about by these global events.

For mountainous regions like the HKH, regional cooperation is even more pertinent than in other regions. We are observing significant rises in temperature, experiencing erratic climates, suffering from floods in some areas and severe droughts in others at the same time, and losing lives and property to natural disasters on an ever-increasing scale. These effects of global warming and climate change have no boundaries. Often the cause lies in one part and the effect in another. What is undeniable is that the solution lies in linking this cause and effect. This year, no country in our region was spared from nature's wrath.

We have recorded some of the worst monsoon floods in recent history, causing the loss of thousands of human lives and property worth millions of dollars. Landslides and flash floods have further aggravated the vulnerability of the fragile landscapes and destroyed roads, bridges, and other vital infrastructure built painstakingly over the years. In my own country, the damage to life and property from the heavy monsoon rains and resulting landslides and flash floods was unprecedented in recent memory. Entire communities in our eastern region were cut-off for weeks from communication, food supplies, and other essentials.

The damage done downstream of the Himalayan mountains, in the flood plains of India and Bangladesh, was even more severe. As demonstrated by the exchange of information on the weather, the formation of artificial lakes, and the behaviour of rivers in their upstream areas, damage to life and property can be mitigated considerably. A shining example of this was the establishment of a monitoring and warning system on the artificial lake upstream from the Kurichu Hydropower Plant and the exchange of information between Bhutanese and Indian officials. I was also told that similar cooperation between China and India in the Western Himalayas on the Parechu River has helped to prepare for imminent disaster downstream along the Sutlej River.

Unfortunately, such exchanges are few and far between. We must build on the positive lessons learned in the past and consciously make an effort to establish a regional flood forecasting and disaster mitigation system. Important initiatives towards this have already been taken by ICIMOD in the form of studies and publications on glacial lake outburst floods, a regional meeting on establishing a network for flood forecasting, and Hindu Kush-Himalayan Flow Regimes from International Experimental and Network Data (HKH-FRIEND). In the coming years, it is likely that floods and other disasters like hailstorms and droughts will only increase and, without an effective regional collaborative mechanism, the cost to individual countries will be high and the impact on the region as a whole devastating.

On the other front, regional cooperation is equally important if we are to derive any tangible benefit from economic liberalisation and free trade regimes. Within our fold, we have the largest and fastest growing markets, yet this has not translated into economic benefits for the people living in mountainous regions. Non-tariff barriers, including inaccessibility, transit regulations, and lack of information sharing, mean that the supply ends of goods and services are not linked to the demand ends. By and large, the niche opportunities and comparative advantages that the HKH has have yet to be exploited for the benefit of the nations and people concerned.

The HKH region is the water tower of Asia with many major rivers originating from it. There are many rivers that flow across boundaries and their use, or misuse, by one country inevitably affects the others along its course. We need to work together at both bilateral and regional levels to harness the enormous potential for hydropower generation. An equitable system needs to be evolved between upstream and downstream nations to share the benefits that will accrue from this renewable energy resource. With such a high population of consumers within the region, there is bound to be a system of collaboration that would bring about a win-win situation for all of us.

Tourism is another important avenue for economic cooperation between the member countries of ICIMOD. We have tremendous potential for a wide variety of tourism products. These include adventure tourism such as mountaineering, trekking, mountain biking, white water rafting, wind gliding, and rock climbing; cultural tourism such as pilgrimages to holy sites, festivals, and to observe lifestyles; and nature watch tourism such as bird watching, flower watching, and wildlife safaris. We also have the potential to promote recreational tourism such as mineral hot spring baths, meditation centres, fly-fishing, and traditional sports. There is so much to be gained from engaging in transboundary cooperation in terms of packaging and promoting these products within the region, and beyond.

Like the rivers, biodiversity species are not confined to national boundaries. Many mammals and birds have specific seasonal migratory routes and habitats. Some plants require the free flow of their genes through various means of conveyance for their survival. Therefore, the conservation of biodiversity must be a collaborative effort by the nations concerned if we are to ensure the survival of some of the rare species of wildlife. Both their habitats and their routes of migration, which often lie in different countries, need to be protected. This calls for a coherent conservation policy and programme that transcends geographical boundaries. I understand that ICIMOD is already working towards developing such cooperation in the Kangchenjunga Landscape Complex involving the linking of parks and protected areas in Nepal, India, and Bhutan. Many more such initiatives involving other countries and partners and focusing on the conservation of endangered species should be encouraged and fully supported.

Bio-prospecting and utilisation must be integral elements of our conservation efforts. Firstly, it is imperative that benefits flow to local mountain communities, without whose participation, support, and commitment, conservation would have little success. Very

often these communities are at the receiving end of prohibitive and authoritarian conservation policies and programmes that they have little incentive to participate in. Similarly, the national exchequers must see some tangible flow of revenue from biological products. For this to happen, more liberal and community friendly conservation policies need to be in place, supported by an active collaboration among regional countries. Knowledge and technologies required for bio-prospecting and processing, as well as potential markets for bio-products, are available within the region, particularly in China and India. Access to this knowledge, technology, and markets would go a long way not only in promoting conservation, but also in alleviating poverty among mountain communities.

In keeping with its mandate, ICIMOD has been very successful in collecting and documenting progressive policies and practices in various fields of mountain development. I understand that it has published and distributed over 800 documents, technical and general, covering a range of issues in mountain development. While it is very important to continue this activity, ICIMOD should work towards a more focused approach both in terms of subject matter and target groups. The initiatives already taken to use alternative media to reach the various clientele, ranging from farmers to policy makers, need to be further strengthened.

There is a growing awareness of the need to have networks of policy makers, professionals, and practitioners in various fields to share information, knowledge, and expertise using various print and electronic media, as well as face-to-face contacts. Concerted efforts need to be made to expand these networks to include various groups and interests, including private firms and development agencies involved in mountain development. The formal and informal networks established or supported by ICIMOD such as the Asia-Pacific Mountain Network (APMN), HIMAWANTI, SAWTEE (South Asia Watch on Trade, Economics and Environment) and others have contributed significantly to developing understanding and cooperation among the Regional Member Countries.

There is considerable scope for collaboration in capacity building among the Regional Member Countries. A network of institutes of excellence around the region could be identified and each assigned a specific area of responsibility for providing training and education. Innovative funding mechanisms such as scholarships from third parties, cost sharing between countries, student exchange programmes among institutes, and self-financing schemes, could be explored. Such a programme would not only be relevant to mountain development but would also be highly cost effective. Some preliminary areas could be natural resources management, mountain risk engineering, water harvesting, renewable energy sources, rural income generation, and the processing and marketing of mountain products. These could be supported through training in GIS and remote sensing applications, participatory planning and management tools, and policy development and advocacy skills.

Finally, it is time for the HKH region to start thinking about a convention to promote collaboration on a more intensive scale in the priority areas of disaster management and economic development that I talked about earlier. With the recent positive and

encouraging trends in geo-political relations among our member countries, I feel confident that we could start working towards such a convention. We could study the Alpine Convention formed among countries of the European Alps, learn from its experiences, and develop a convention that meets our specific requirements.

Mr Chairman, Ladies and Gentleman, networks of institutions and broad cooperation in the region and beyond foster the sharing of knowledge. The solution to development problems and the achievement of the Millennium Development Goals requires the effective use of existing knowledge and the generation of new knowledge relevant to development.

Knowledge is one of the key factors in solving development problems. At all levels, from rural communities, through to extension workers and local administrators, to policy makers and top government officials, problem solving depends, to a great extent, on access to knowledge – individual and institutional knowledge, local and global knowledge, and, often overlooked, knowledge from local experts or ‘indigenous’ knowledge.

The need for information and knowledge is huge – by the farmer trying to understand what is needed for a new crop that he is growing for the market, by development workers who want to know about the results of similar initiatives in other areas, by donor agencies who want to be sure that a new proposal is not just a duplication, and by policy makers trying to develop a new policy for the efficient management of resources. However, there is no easy way for those who need information and knowledge to find out what exists that is relevant, where it is, or how to access it.

There is a common belief that the HKH region is ‘information poor’, and that the lack of appropriate solutions to development problems is the result of insufficient knowledge being available. This is not actually true; there is a large amount of information and knowledge in the region relevant to sustainable development. The problem lies in knowing where to find it, knowing that it exists, and knowing how to access it. This information and knowledge is contained in a diverse array of places: libraries, monastery records, oral testimonies, publications, films, training manuals, project reports, government departments and local authority records, NGO observations, research theses, and many more. The forms in which information and knowledge are recorded are equally diverse: from electronic media to paper, as well as in tacit indigenous knowledge.

ICIMOD and its partners need to address the issue of how we can get available knowledge and information to the people who need and can use it. This is a challenge around the world, and nowhere more so than in the Hindu Kush-Himalayan region where the need is so great and communication pathways mostly underdeveloped, or even nonexistent.

The HKH region spans populaces speaking a wide variety of languages, and their knowledge is also described in many languages. Local specialists, farmers, craftsmen,



business men, and the public at large – in short, all knowledge seekers – should be able to obtain, in their major local language, the information that the knowledge that they seek exists, and where possible, obtain it in a language and format appropriate for their use.

In an extremely diverse region like the HKH, the geographical context of information can play an important role in determining its relevance for a particular user and use, as can the location of contacts and institutions. Such information of geographical context should be part of the delivered knowledge.

ICIMOD, as an international centre dedicated to integrated mountain development in the HKH region and cooperating with over 300 organisations in eight member countries, is well positioned to lead a partnership and find innovative solutions for knowledge sharing and knowledge delivery to remote rural communities, so as to reduce environmental degradation and poverty in the region.

Mr Chairman, Ladies and Gentleman, let me conclude by re-emphasising the importance of regional cooperation and knowledge sharing in our common pursuit of the sustainable livelihoods of our mountain communities. Whether we talk of reducing physical vulnerability or social and economic vulnerabilities, regional cooperation offers us the best hope to address these issues effectively. In an increasingly regionalised and globalised world, we should work towards the consolidation of our unity, our strengths, and our solidarity, so that we can achieve our common goal of Gross National Happiness for our people, regional prosperity, regional peace, and stability.

Before I stop, let me once again extend a very hearty congratulations to the Board, the Support Group, and the Director General and Staff of ICIMOD on holding this Symposium on the occasion of the inauguration of their new headquarters building. Let me also extend my heartfelt thanks to His Majesty's Government and the friendly people of Nepal for their hospitality and wish them a speedy return to peace and prosperity.

## **Panel Topic – Learning from Global Knowledge Initiatives**

*Synopsis prepared from the presentation and panel commentaries given by Dr Anne Whyte, Mestor Associates Canada, Vice-Chair ICIMOD Board of Governors and Chair of Programme Advisory Committee*

### **Introduction**

Networks like the Mountain Forum are part of a growing body of experience of global and regional knowledge networks, which are different from information networks in that they create added value and new knowledge. Formal knowledge networks are networks that are purpose driven and deal with problems or issues, and create and aggregate, and thus transfer knowledge, rather than just sharing or moving information around.

Some knowledge networks have operated for decades such as the Commissions of IUCN. Others, like the World Bank's Global Development Network or the Canadian hosted 'Bellanet' are more recent. Bellanet is an example of a network which successfully created new tasks for itself from those originally envisaged by its founders.

Dr Whyte outlined the ten characteristics of a successful knowledge network based on her experience and involvement in a number of global knowledge networks, including the Millennium Ecosystem Assessment; a task oriented, five-year process, in which 1,360 scientists, 91 governments, and 4 international environment convention secretariats were involved in assessing the state of the environment.

## **Characteristics of a successful knowledge network**

1. Knowledge networks are most effective when they are purpose driven. The narrower the purpose, the greater the chance of success, or uptake of the output of the network by the end user.
2. Knowledge networks should be working networks. They should have clear outputs and target groups. Members should work together on solutions, such as doing research. There should be as much 'work' as 'net', although people often like to 'net' more than 'work'.
3. Knowledge networks should be built on expertise rather than just an interest in the topic. This has important implications for the identification and selection of networks. Sometimes this means saying 'no' to important individuals or organisations that want to be members. Knowledge networks have to be merit-based in terms of membership. A very important question to be asked is: "what is the value of this member to the network?". In the IUCN commissions this has been a real challenge; IUCN is on a growth trend and has experienced dilution of expertise over the last four decades in some of its commissions.
4. Knowledge networks need to be managed to make them effective and efficient. They should have network goals and objectives and clear membership criteria, governance, and decision-making mechanisms. They require a network manager to keep the focus on the goal and to manage the flow of communication more freely.
5. Knowledge networks should try to cut across organisational and sectoral boundaries and capture as much diversity in terms of organisations and sectors as they can possibly manage including government organisations, university research, private organisations, and NGOs. However, at the same time diversity makes it more difficult to manage the network.
6. Knowledge networks should be task driven, but are more successful where they increase the capacity of most members. Capacity building should be encouraged.

The learning of new things and ideas is very important to encourage members to participate.

7. Knowledge networks need institutional commitment, even if they are made up of individuals. The implementation or transfer of knowledge is much more likely if the institutions involved are committed to the networks. Institutions facilitate continuity, as staff come and go but institutions remain. For sustainability of a network, institutional commitment is necessary. It is valuable to have institutional commitment from the top, and to build on it. Ideally, knowledge networks should be integrated throughout the organisations involved, but this is difficult to achieve.
8. Knowledge networks have to be first and foremost communicating networks. Effective communication across the network is its life blood. Vertical communication, both top down and bottom up, are essential communication pathways. Along with vertical channels, horizontal communication is also very important. Horizontal communication between network members should be encouraged and developed. This is where creativity and innovation play key roles, but achieving sustained and vigorous interchange between members rather than just up and down the hierarchy has been a difficult task for many organisations. Knowledge networks, in their communications, need to be both structured and democratic, and to be successful all members should have access to the same information. A good rule of thumb in managing networks is that 2% of the time should be invested in technological aspects, and 98% in human relationships.
9. Another important characteristic to note for successful knowledge management is that 'what you can't measure you can't manage'. Networking needs to be monitored and evaluated. But most evaluation tools are for measuring projects, programmes, and organisations rather than networks.
10. Finally, knowledge networks can only succeed if they also engage the end users of the knowledge that they are creating. In a knowledge economy, information can be freely available so that if the network is to be successful in its task, there should be a process of engagement with the end users, which in some cases may mean that they are brought within the knowledge network itself.

## Conclusion

Together these ten characteristics can constitute what is sometimes called 'the network advantage'. It would be a useful exercise for ICIMOD to review its own knowledge networks in the context of the ten characteristics to see where they might be strengthened and what strengths already exist to build on. This information will help not only ICIMOD but also its regional and country partner organisations, many of which are working with ICIMOD in regional and global knowledge networks.

## **Panel Topic – Identifying and Upscaling Successful Development Approaches**

*Synopsis prepared from the presentation and panel commentaries given by Mr Shoaib Sultan Khan, Aga Khan Rural Support Programme Network (RSPN), Pakistan*

### **Establishment of the Aga Khan Rural Support Programme**

The Aga Khan Rural Support Programme (AKRSP) was established in 1982 in Northern Pakistan with the strong interest of His Highness Aga Khan as a part of the Aga Khan Development Network. His Highness provided every kind of support for the programme and gave the responsibility for its commencement to Mr Khan. AKRSP was developed with the objective of poverty alleviation involving grassroots communities.

### **Introduction to the AKRSP**

The AKRSP is an internationally recognised community-based development organisation that works in partnership with local communities living in the high mountain ranges of Northern Pakistan in the field of integrated rural development. AKRSP's mission is to alleviate poverty through the promotion of sustainable livelihoods.

AKRSP's work in northern Pakistan has had a significant influence on development policy and practice, nationally as well as internationally. The development model adopted by AKRSP has itself been widely replicated. A network of Rural Support Programmes now exists all over the country with the mandate to design and implement strategies for the alleviation of rural poverty. In South Asia and other parts of the world, programmes based on this model have been set up to promote grassroots development through the involvement of local communities.

Both external evaluations of AKRSP and internal assessments provide evidence of the substantial impact of the Programme on economic and social development in the region. A network of about 2,400 village organisations and 1,400 women's organisations, with about 85% of the total households in the area as members, has made possible the broad-based participation of villagers in managing their own development.

It is in recognition of this fact that the present government of Pakistan has allocated more than Rs.45 billion for rural development, which will be used through rural support programmes in the country. Beside this, the Government of Pakistan has also created a pool fund called the Pakistan Poverty Alleviation Fund, which also supports rural development initiatives in Pakistan.

### **The Rural Support Programmes: Replication of AKRSP**

The AKRSP programme was assessed and evaluated independently by the World Bank; it was found that the income of the population had doubled and that the programme

had proven successful. Thus, the Government of Pakistan replicated the rural support programme (RSP) model in other areas of the country.

The objective of the RSPs is to foster a framework of grassroots institutions through a process of social mobilisation in the villages of Pakistan by harnessing people's potential to help themselves and enabling communities to identify and undertake development activities that are needs-based, effective, and genuinely sustainable. The RSPs that are currently operating in Pakistan are listed in Table 1.

**Table 1: RSPs currently operating in Pakistan**

RSP	Presence In	Start Up Year
AKRSP	Northern Areas, NWFP	1983
SRSP	NWFP	1989
NRSP	National	1992
GBTI	NWFP, Punjab	1995
LPRP	NWFP	1997
PRSP	Punjab	1998
BRSP	Balochistan	2001
SRSO	Sindh	2003

programme is to get the requisite resources from the government while retaining programme autonomy.

In Mr Khan's experience, programmes like the RSPs can only be achieved successfully by remaining outside the government. This was the success of the AKRSP. A National Rural Support Programme was set up to replicate the success of the AKRSP with an endowment of US \$20 million, mainly to facilitate institutions in poverty alleviation. The RSP programme was followed by the Bank, which persuaded the Water and Power Development Authority (WAPDA) to set up a similar institution to take care of the effects of the Ghaziboradha Hydropower project. Likewise, other states within the Pakistan also came forward to extend and establish RSPs in their areas.

## Conceptual package of social mobilisation

Social mobilisation is based on the assumption that the poor, landless, and assetless have the capacity and are willing to undertake development activities to improve their livelihood. The RSPs, as support organisations, enable this potential to be harnessed through a process of social guidance. This entails the following:

- social organisation – bringing the poor into an organised fold;
- human resource development – upgrading the human skills of the poor, such as managerial, productive, and cooperative skills to enable them to make the best use of available resources; and
- capital formation – the generation of capital through the discipline of saving, as capital is power, without which the poor can never hope to be self reliant.

## *The process*

The main steps in the process are as follow.

1. A series of dialogues with communities to ascertain their willingness to enter into a partnership with the RSP.
2. Acceptance of a Terms of Partnership offer from the RSP agreeing, for example, to identify activities that they can undertake, to form a community organisation (CO), to meet regularly, to save regularly, and to select genuine activists. The community then does a poverty ranking of all households in the locality.
4. A CO is then formed ensuring the inclusion of the poor households in the community.
5. The CO starts meeting and saving and identifies office bearers and activists.
6. The CO prepares micro-investment plans at the household, group, and community levels, identifying the support required from RSP, commonly such things as credit, technical assistance, input supply, and skills training (see example in Table 2).
7. The RSP responds accordingly, providing access to technological packages to increase productivity.
8. The RSP facilitates linkages with government departments, district governments, NGOs, and others.

**Table 2: Example of micro -investment plan outline**

Level	Plans Identified	Support
Household	<ul style="list-style-type: none"><li>• income generation</li></ul>	<ul style="list-style-type: none"><li>• line of credit</li><li>• training</li></ul>
Group Level	<ul style="list-style-type: none"><li>• land development</li><li>• enterprises</li><li>• input supply and marketing</li></ul>	<ul style="list-style-type: none"><li>• line of credit</li><li>• training</li><li>• technical assistance</li></ul>
Community Level	<ul style="list-style-type: none"><li>• social sector services such as:<ul style="list-style-type: none"><li>- water supply and sanitation</li><li>- health and family planning</li><li>- education</li><li>- infrastructure needs</li></ul></li></ul>	<ul style="list-style-type: none"><li>• productive infrastructure</li><li>• linkages with government, donors, NGOs, and others</li></ul>

## *Including the poor in community organisations*

The involvement of the poor in community organisations is very important to make the programme effective. For that, a village profile must first be developed to provide a benchmark, then poverty assessments need to be performed to identify the well-to-do; better off; poor; very poor; and destitute.

## **RSPs and the government**

### *RSPs — complementing the role of government*

The RSPs complement the role of government at the village, community, and mohalla level by

- creating a network of COs through which the government works;
- facilitating bottom-up planning through a needs identification for village and inter-village schemes;

- development of low-cost village infrastructure models that ensure community involvement, contribution, and responsibility for operation and maintenance; and
- implementation of inter-village infrastructure schemes through cluster organisations like farm to market roads, culverts, and water courses.

### *Potential linkages between RSPs and government*

The potential linkages between RSPs and government at the inter-village and union council level include

- linkages between government extension agents and COs, e.g., village health workers, family planning workers, and agriculture extension;
- improving the quality of primary education by increasing enrolment, reducing dropouts, and curbing teacher absenteeism through community organisation managed school management committees; and
- improving service delivery of basic health units, family welfare centres, and other government facilities by involving cluster organisations in their management.

### *South Asia Social Mobilization Network (SASMON)*

The South Asia Social Mobilization Network (SASMON) is housed in the RSP network and is managed by 26 member organisations in eight countries in South Asia. The goal is to facilitate member organisations in their objective of improving sustainable livelihoods through

- web-based sharing of experiences and best practices, and
- encouraging on-line debate between members on critical issues of social mobilisation.

The achievements of SASMON to date are as follow.

- SASMON website designed and hosted.
- Free email facility, web calendar, and discussion forum online provided.
- The SASMON website linked to 30 other major development sites.
- Data from country focal points and member organisations collected and uploaded onto the website.
- Reports, notes for the record, and publications from members and other organisations are collected and uploaded on the website.
- RSP Network Pakistan website designed and hosted.
- HRDN Pakistan website designed and hosted.
- Training programme on social mobilisation for 28 participants from the Maldives arranged through the National Rural Support Programme-Institute of Rural Management.
- Training programme on social mobilisation and micro-credit for 11 participants from the Maldives arranged through the National Rural Support Programme-Institute of Rural Management.
- Assisted National Rural Support Programme in international IFAD workshop on Gender.



## Conclusion

Experience suggests that the time for 'feel-good' projects is over – good projects have already been developed. The problem or main issue for ICIMOD in the current context is to scale up its existing programmes that have a potential to enhance the livelihood of mountain people in the HKH.

For ICIMOD, the time has come to show the contribution that it has made, and can still make, to the lives of mountain people in the HKH, as per the objective of the founders 21 years ago. What has been achieved at the Godavari Demonstration and Training Centre site should be demonstrated to the neighbours; this is very important to gain their goodwill.

## Panel Topic – Linking Knowledge Providers and Users

*Dr Zbigniew Mikolajuk, Programme Manager, IKM/IMCO, ICIMOD*

### Introduction

Knowledge is retained, encoded, transferred, and described. As knowledge providers, people and institutions create and retain knowledge; as knowledge users, they also need and seek knowledge. I will examine how knowledge providers and knowledge users relate to knowledge dissemination and knowledge sharing systems, and how, and why, we approach the following questions, which we try to answer in our development work.

- Who are the knowledge seekers?
- What knowledge do they seek and need?
- Who are the knowledge providers?
- How can providers and seekers be linked?
- How can the right knowledge be provided?

### The problem

To solve any problem, people need knowledge. The right knowledge is there somewhere, described in some way, but it is often unavailable to those who need it most, at the time and the place that they need it.

A farmer needs to know about climate changes and plant types to produce new and better crops. An extension worker needs knowledge of new agricultural technologies. An administrator needs to know about new legislation and governance. A decision maker needs knowledge relevant to the development of new policies.

### Definition

Defined practically, knowledge is the ability to take effective action [Dave Snowden]. This means that just making information available is not enough. To become knowledge, information has to have some kind of effect. For example, unless a farmer understands information about fertilisers and uses it to gain a tangible effect, the information is not knowledge.

Knowledge can be delivered in many ways. Whatever method is used, absorbing knowledge implies internalising information and being able to use it to solve problems and answer questions. We will not dwell on the theoretical definitions of knowledge, but from a pragmatic point of view, we will look at how knowledge is described (factually – what? and procedurally – how?), and how to connect the right people or institutions that possess the right knowledge with those who need this knowledge.

ICIMOD and its partners are both knowledge providers and knowledge users. We will concentrate in this paper on their role as knowledge providers and how they are linked to knowledge users.

## **Making knowledge available**

The main issue is how to make knowledge available to those who really need it. In this age of great scientific advances we appear to possess information on just about everything. This includes technical issues, social and political sciences, and expertise in financial matters. If there is so much sophisticated and advanced information, why is it so difficult to solve such basic problems as the provision of clean drinking water, effective health care and education for everyone, and the elimination of hunger and poverty?

Over the last 20 years, ICIMOD and its partners have created, collected, and described knowledge in many disciplines relevant to mountain development. We all know about ICIMOD's excellent publications on social, environmental, and natural resources and other issues vital to improving life in mountainous regions, and ICIMOD's continuous efforts in capacity building. We also know about the efforts made to share knowledge with rural communities and policy makers. Have we done enough? Have we made a positive impact on knowledge sharing?

People and communities may need the knowledge accumulated by our organisation to make a real difference in solving development problems, so our knowledge resources need to be shared. A short note from the profile of Professor Anil Gupta says: "Prof Gupta realised that the resource in which poor people were rich was their knowledge, values, and institutions. Unless we build upon their creativity and innovative potential, the development process cannot become dignified." Thus, the answer to why all this knowledge has not been translated into poverty reduction, appears to lie in the knowledge sharing process.

## **Knowledge sharing**

At all levels of human activity, people look for knowledge that will help them to achieve their goals. Collecting, describing, and transferring knowledge involves the use of emerging technologies and organisational structures, from the simple oral tradition, through to printed materials, and the latest advances of the Internet.

The issue remains the same: how can the people who possess the right knowledge share it with the people who need it, and what makes people share their knowledge? How do we link knowledge providers and knowledge seekers?

Access to the knowledge that is needed, or in many cases, just knowing that information actually is available, is one of the critical issues for development initiatives. Linking knowledge providers and knowledge seekers effectively means sharing the information about the available knowledge resources (making people know that the information that they need exists somewhere and can help them), and establishing communication and delivery channels.

For example, an organisation that develops a new method for the prevention of soil erosion produces the results of its work as a collection of documents (case studies), research reports, and audiovisual materials. The knowledge encoded in these objects is needed by farmers and extension workers, as well as policy makers. What needs to be done to make this knowledge useful to different users?

Linking knowledge providers and users requires answering the following questions:

- How can a potential user know that the knowledge he needs actually exists?
- Is the information in a form that can be absorbed by the knowledge seeker?
- How can the seeker access the knowledge?
- How can the user give feedback on the relevancy and usefulness of the knowledge provided to him?
- How can we make the process of knowledge packaging and delivery more efficient?
- Is it feasible to provide universal access to knowledge to remote and poor communities?

### **On packaging and access**

A short story about a farmer in Mindanao is an example of the importance of knowledge delivery. The farmer visited a village that had just established a telecentre. A group of people were looking at the computer screen. He joined them to watch a presentation on how to raise ducklings. He liked the story very much and applied the newly acquired knowledge. Now, he is one of the richest farmers in his village.

The story is not about the telecentre but about accessing relevant knowledge that was presented in an effective format. Perhaps a brochure, or radio broadcast, or a lecture from an extension worker wouldn't have had that effect, but it is likely that if there were other duckling breeders around, the farmer would have learned from them and not the telecentre. In this situation, entirely new knowledge was delivered effectively. This required someone with the knowledge packaging it and the knowledge reaching the farmer.

### **On knowledge making other provisions effective**

Another crucial need is to ensure that resources are accompanied by the information needed to make the resources useful. For example, with the decentralisation of water supply management, provinces in one country were given the legal and financial resources to plan and manage the residential and industrial water supply. However, the provinces did not have sufficient knowledge to forecast the demand for water, maintain the facilities, or allocate funds. Relatively simple computer programs to support

planning and data collection would be an immediate answer to the problem, but a whole programme of capacity building would be necessary to make the decentralisation effective and help the provinces manage their water supply systems well.

## **On expectations**

In some development projects, people are asked to do tasks that they do not have the knowledge to perform. Although we provide the resources, it is essential not to overlook the equally important issue of providing the knowledge that will make these resources useful. We are doing more than just giving a fish, but we also can't just give a fishing rod and bait; we have to teach them to fish.

## **On the factors that help knowledge sharing**

Linking knowledge providers and knowledge users in an effective knowledge sharing system is a complex undertaking that includes technical, organisational, financial, and social elements. An effective knowledge sharing system also needs consent at the political level.

## **Main Issues**

The main issues for knowledge sharing are summarised in the following.

- a. A political will and popular understanding of the value of knowledge sharing must exist at all levels of society and administration. A knowledge sharing system is not a replacement for an educational system, but rather a tool that is used to deliver needed knowledge at the right time and place.
- b. Knowledge is a human faculty and ultimately resides in people, not in machines and books. In a knowledge sharing system we are dealing with knowledge descriptions or representations such as written documents, maps, pictures, stories, audio, and video clips, as well as direct communication between experts and knowledge seekers.
- c. The analysis of needed knowledge for diverse users is a continuous process. We should know what knowledge is needed, in what format it can or should be delivered, and how effective the knowledge acquired with the assistance of the system was.
- d. Solving the problem of intellectual property rights and creating financial arrangements for the contribution of knowledge are necessary for an effective operational system. We must ensure that an equitable part of any wealth, generated from the shared knowledge contributed by poor communities is shared with the knowledge providers.
- e. In order to reach remote and poor communities with large illiterate and semi-literate populations, we must design appropriate knowledge delivery methods, like interactive theatre and visual presentations. Knowledge objects must depict very specific local issues and be delivered in local languages. Information delivery must be customised and personalised. We need a feedback mechanism that allows providers to know if the delivery methods are effective and if the information was

understood. We must also keep in mind that the poorest and least educated users, who are often those that have the most to gain, have little if any experience in seeking knowledge in a larger system that goes beyond their community.

- f. Developing knowledge sharing in a society is a long-term process that needs to be embedded in other social and developmental initiatives. It requires commitment from political powers, civic organisations, and technical and research establishments interested in the empowerment of all social groups. We should regard knowledge sharing as a public good.

Knowledge sharing is not a solution to development problems, but it is an important factor in finding effective ways to deal with such issues as natural resource management, health and child care, employment, governance, and ultimately poverty reduction.

## **Conclusion**

ICIMOD and its partners are in a unique position to foster the region-wide sharing of knowledge pertinent to mountain development. Cooperation between knowledge providers at national and regional levels needs a driving force and the application of adequate technologies.

The role of ICIMOD is to build awareness about the benefits of knowledge sharing, to investigate and promote new technologies and methods supporting knowledge sharing, and to assist its partners in capacity building. Practical steps need to be taken to use better the wealth of knowledge objects produced and accumulated by ICIMOD and its partners (books, manuals, posters, brochures, films), and in particular to develop effective means for knowledge delivery to remote communities and less privileged groups in society.

## **Panel Topic – Lessons from the Alpine Convention Experience for the Hindu Kush-Himalayan Region**

*Dr Eklabya Sharma, Programme Manager, NRM, ICIMOD*

Mountain regions are a source of vast reserves of valuable resources including water, energy, and biological diversity; and they are important in terms of their vital ecological, economic, recreational, social, and cultural functions. Mountain regions are home to a unique heritage of human kind. Because most mountain regions include transboundary ranges, mountains are politically sensitive systems, and therefore require careful attention. There is a deep concern that, due to increasing human activity, climatic variation, and other external and internal factors, many mountain ecosystems are in decline in terms of their valuable functions and services, and that poverty is on the increase in mountain regions. We see a disproportionate number of armed conflicts and migrations from mountain areas. Major immediate challenges facing mountain regions include poverty reduction, sustainable natural resource use, and the containment of regional conflicts.

There are many great mountain systems and cultures in the world. The Alps, Andes, Carpathians, Caucasus, Central Asian Mountains, and Hindu Kush-Himalayas are some examples of transboundary mountain systems. Such transboundary mountains face many more challenges as they are governed by different political systems. There is a strong need for cooperation among the countries sharing these mountain systems towards their development and in sustenance of the flow of goods and services from them. One such example of cooperation between the countries sharing a transboundary mountain system is the Alpine Convention.

The Alpine Convention was agreed upon in 1989, signed in 1991, and came into force from the year 1995<sup>1</sup>. All eight Alpine countries and the European Union are signatories to it. Experiences with the Alpine Convention are new and evolving. Some of the agreed areas of cooperation of immediate benefit are in nature and landscape protection, mountain forests, mountain farming, tourism, soil conservation, and energy and transport-related infrastructure.

Lessons provided by the Alpine Process have a global significance as the only example worldwide of a legally binding inter-governmental mountain agreement. Despite some difficulties, it has evolved into a successful platform for regional exchange and negotiation, and for sustainable development. Lessons from the Alpine Process and experience were drawn for other mountain systems of the world during the International Year of Mountains at Berchtesgaden in Germany, and were put together in the form of a declaration and recommendations<sup>2</sup>. This paper summarises the lessons from the Alpine Process and the workshop for regional conventions in other mountain areas, and their relevance to the Hindu Kush-Himalayas and ICIMOD.

## **Learning from the Alpine Process**

The experience of the Alpine Process has many key elements. First, the Alpine Process demonstrates that regional cooperation, as a process, owes its success to the participation and support of local populations and local governments right from the earliest planning stages, rather than to a legal framework alone. Second, NGOs have played a key role in the formulation and promotion of the framework agreement, and in the actual implementation and projects. Community networks and committed citizens have fostered the acceptance of the Convention among Alpine populations, and have enabled related measures at the local level. Third, the Alpine Process lives through locally implemented programmes and projects, as well as through regional exchanges of experiences. Non-government organisations in the Alps have been instrumental in ensuring the existence of the framework convention and in the implementation of concrete activities and projects. A network of local governments and other citizen networks have facilitated the acceptance of the Convention and provided continuous support for the required changes at the local level. Fourth, the key to the success of the Alpine Process is transparency and continuous communication among governments at

<sup>1</sup> The Convention on the Protection of the Alps (Alpine Convention), URL: [www.conventionalpine.org/page2\\_en.htm](http://www.conventionalpine.org/page2_en.htm)

<sup>2</sup> The Alpine Experience - An Approach for Other Mountain Regions? Berchtesgaden Declaration 2002. URL: [www.cipra.de/berchtesgaden/hauptseite%20englisch/index.htm](http://www.cipra.de/berchtesgaden/hauptseite%20englisch/index.htm)

all levels and with local civil society. The exchange of region and location-specific information at the regional level is a precondition for fruitful cooperation. Fifth, many of the principles, as well as the implementation experiences, of the Alpine Process are likely to prove relevant and helpful. These principles are to hold governments accountable; keep a regional focus; foster equality and equity; decentralise; set clear objectives; encourage the participation of local communities and civil society organisations; establish networks; build capacity and share knowledge; encourage partnerships; and engage the international community.

## **Lessons for regional conventions for mountain areas**

The Berchtesgaden Recommendations<sup>3</sup> deal with key structural and legal factors involved in the development of international conventions in mountain regions. Some of the lessons from the Alpine Convention for other transboundary mountain areas of the world are summarised below.

- 1) The conditions in mountain areas vary widely, and the Alpine Process and Convention are not simplistically transferable. Creative use should, however, be made by other mountain regions of the lessons learned in the context of the Alpine Convention and Protocols. This becomes especially meaningful when lessons are applied more narrowly with regard to specific sub-topics and themes.
- 2) The points of departure for elaboration of any regional convention should be the specific regional needs and circumstances, the regional state of development, and the degree to which there is a tangible commonality of objectives. An essential precondition for the elaboration of a convention is at least a partial political convergence of the participating states, and a shared determination to overcome obstacles by way of collaboration.
- 3) Regional cooperation does not necessarily require a convention. Rather, case-by-case there may be useful instruments (strategies, programmes, or charters) below the level of a convention proper, which can serve as useful stepping-stones.
- 4) The quality of the process matters. In the elaboration of draft agreements aiming at regional cooperation and/or a convention, the involvement of offices outside the central government, at regional and local levels, is strongly recommended. A 'bottom-up' approach is also recommended. A dynamic convention process is unlikely to succeed in the absence of local participation and general public support. In order to enlarge the basis for a convention process, the strengthening of regional networks, e.g., in the area of nature protection or of communities, is recommended.
- 5) Targets must be achievable. Good cooperation depends on success. Therefore, states should define truly achievable goals, which can realistically result from their cooperation. In this sense, an exceedingly tight copy of the Alpine Convention might not be recommendable, as it could stand in the way of carefully tailored, situation specific approaches.

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<sup>3</sup> The Alpine Experience – An Approach for Other Mountain Regions? Berchtesgaden Recommendations 2002. URL: [www.cipra.de/berchtesgaden/hauptseite%20englisch/index.htm](http://www.cipra.de/berchtesgaden/hauptseite%20englisch/index.htm)



## HKH relevance

The Hindu Kush-Himalayas (HKH) comprise eight countries – Afghanistan, Bangladesh, Bhutan, China, India, Myanmar, Nepal, and Pakistan. Participants from all of these countries except Myanmar were involved in the Berchtesgaden Conference 2002. These participants converged to a regional workshop for the HKH region, representing governments (ICIMOD Board Members), non-government organisations, academia, and international institutions. They noted that a considerable history of cooperation on mountain issues and joint concerns already exists in the HKH region. Examples include the establishment of ICIMOD, and many strands of cooperation in relation to information sharing, technology sharing, joint research, vibrant networks, and policy initiatives.

It was realised that the HKH region is different in many significant ways from the Alps. All of the countries in the HKH region are ‘developing’ lower income countries, while in the Alps all the countries are comparatively affluent. In terms of environment and geology, the HKH region is a more fragile and much larger scale mountain system of more recent geological origin. It is highly populated, people are poor, and resource degradation rates are very high. The political situation is difficult and very sensitive. The HKH region needs a long-range vision for cooperation, and building trust among member countries is a key initial step. Regional cooperation and integrated approaches would be very valuable in solving current, intricate problems.

The workshop recognised that within the HKH region, increased cooperation is needed, primarily to improve the livelihoods of mountain people. Measures recommended for cooperation include information sharing, establishing networks, and collaborative actions within identified policies. Areas for possible cooperation were prioritised as (a) biodiversity, where transboundary conservation through a system of contiguous protected areas can be strengthened or initiated as applicable; (b) technology and information sharing on agricultural practices, natural resource management, and hazards; (c) watershed management and water resources; (d) the promotion and exchange of cultural indigenous knowledge; (e) cooperation on early warning systems, mitigation, and control of hazards; (f) economic activities with people-centred approaches aimed at environmental sustainability within a regional vision; and (g) areas of ecotourism and the development of hydro-electric power.

In addition, some ideas on the parallel pursuit of like-minded policies and strategies were contemplated at the workshop. They are (a) increase the comprehensive understanding of natural capital; (b) integrate mountain specific policies within national governments; (c) increase public awareness of mountain issues; (d) capacity building of stakeholders; (e) exchange of technological solutions and skills; (f) regional institutional linkages; (g) develop and implement poverty reduction strategies for mountains; (h) develop joint programmes at the national level interlinked by a regional umbrella; and (i) regional exchanges that have great potential for building trust and cooperation.

ICIMOD's current Strategic Plan and Medium Term Action Plan deal with most of the thematic areas that were identified during the Berchtesgaden Conference for cooperation in the HKH region<sup>4</sup>. ICIMOD's experience shows that regional cooperation does not necessarily require a convention and can be done at a lower level. One good example in our recent programme is transboundary biodiversity management in a landscape in the Eastern Himalayas where Bhutan, India, and Nepal are cooperating. However, our experience shows that there has to be more political commitment and stewardship from regional countries to foster such cooperation. Stronger cooperation may lead to a greater Himalayan convention in the future. In that case ICIMOD could be an implementation institution for technical exchange and cooperation under the convention.

The most important lesson from the Alpine Convention for the HKH region is to generate political commitment among member countries for cooperation on mountain specific sustainable development.

## Discussion and Recommendations: Session IV

The plenary discussions after the presentations in Working Session IV focused mainly on the need for, and ways to, scale up existing projects. Mr Khan outlined what he had found, through his extensive work, to be the key qualities for upscaling, which included:

- having a quality product and a clear theoretical framework and methodologies (something that has been time tested and proven),
- champions to promote the approach,
- independence and autonomy,
- willingness of the community to come out of poverty, and
- genuine leaders from within the community.

Another issue raised was language, as all of the deliberations and presentations here were in English. It would be good if information could be made available in local languages and in a way that is useful to grassroots organisations. Moreover, questions were raised about the provision of continual support, both financial and technical, to the networks set up by ICIMOD.

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 IV are listed below.

- To deal with the challenges posed by global developments such as global warming, institutions like ICIMOD can play a role through the continuous development of early warning and monitoring systems.
- ICIMOD should scale up projects to show it is reaching the over 120 million poor people in the region more effectively. It was suggested that demonstration sites like Godavari be introduced in the Regional Member Countries and that ICIMOD's

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<sup>4</sup> *Partnerships for Sustainable Mountain Development: Securing the Future of the Hindu Kush-Himalayas, Strategic and Medium Term Action Plans, 2003-2007*. Kathmandu: ICIMOD

documents be published in regional languages, to help disseminate information and facilitate scaling up.

- In relation to knowledge management, there is a need to find an effective means of delivering knowledge including how best to package knowledge for different audiences and needs.
- Lessons learned from the Alpine Convention need to be promoted among the Regional Member Countries and there need to be policies and strategies for parallel pursuit. There is also a need for joint programmes at the national level, interlinked by a regional umbrella, and a need for capacity building and trust building. The mountain states play a key role in promoting this type of cooperation.

# **Concluding Session**

***Rapporteur's Summary***



# Working Session I: Securing the Mountain Environment

*Chair: Mr Egbert Pelinck*

Mr Pelinck congratulated everyone on the opening of the new ICIMOD headquarters, which placed it in a better position to serve the people of the Hindu Kush-Himalayas. He introduced the session format, comprising a Keynote Address and four panel presentations to be followed by a floor discussion.

The keynote speech by Dr Massimo Antoninetti on Advanced Technologies for Mountain Environment Research and Management highlighted the role of modern advanced technologies in greatly improving our knowledge of the complex interactions between the environment and human activity. Technological opportunities must foresee the involvement of experts to avoid misinterpretation of data and resulting errors, while reaching out to as wide a user community as possible. Only multidisciplinary expertise like ICIMOD's can successfully contribute to avoiding the risks posed by the inappropriate adoption and use of advanced technologies, while ensuring that their benefits are taken advantage of for the maximum common good.

The presentation by Mr R Rajamani on the Impacts of Global Warming and Climate Change on Mountain Ecosystems recommended possible future areas of studies and for action plans. The suggested areas include the rise in temperature and/or humidity in mountain ecosystems; the effects of anthropogenic pressure; heat islands; the direct impact of global warming on all of the special characteristics of mountain ecosystems; and others. Moreover, it was suggested that ICIMOD persuade GEF and others to fund related projects and to take on joint studies of Indian mountain ecosystems.

The presentation by Dr M Sharif Zia on Environment Services and Upstream-Downstream Relationships in Pakistan suggested the development of a systematic mountain environment monitoring system and associated capacity building of national institutions. Other recommendations included the development of environmental services agreements and region specific approaches for the valuation and contracting of upstream environmental services. Policy makers now need to focus on creating a high rate of sustainable national growth.

The presentation by Prof Xu Jianchu on Securing Community Participation in Conservation suggested a participatory approach for learning by sharing and creating space for local communities in terms of representation, resilience, and readaptation, and by levelling the playing field. It made a call for community based science.

The presentation by Mr Basanta Shrestha on Geographic Information for Sustainable Mountain Development in the Hindu Kush-Himalayan region argued that geographic information provides a unifying framework for understanding mountain ecosystems, their functioning, and management. Geographic information promotes regional collaboration and supports sustainable mountain development planning and decision making.

The subsequent floor discussion focused on two key issues, upstream-downstream relationships and the use of knowledge thus far accumulated. Under the existing social and economic systems, upstream problems tend to be neglected and upstream environmental services are not well compensated, although some efforts are now geared towards development in upstream areas. On knowledge management, concerns were raised about how the knowledge created is being put into practice and what constraints there are for policy/decision makers to use the generated knowledge. The floor discussions also touched upon the need for community involvement in addressing sustainable development issues and the fact that given proper training, increased population could be turned into a valuable asset.

## **Working Session II: Securing Sustainable Use of Mountain Resources**

*Chair: Mr Peter Gueller*

The Keynote Address given by Dr Phrang Roy, Assistant President Asia Pacific of IFAD focused on the role of common property resources in improving the livelihoods of mountain people, especially as more and more of these resources now have open access. There is a need to understand indigenous people's knowledge, in particular women's knowledge, and the traditional checks and balances used to manage CPRs. Appropriate technologies need to be developed for uplands and mountain regions. This was echoed by Dr Nyima Tashi during the discussions in Session III when he pointed out that there need to be technologies that address rural poverty, but that farmers will only accept such technologies if they sustain and utilise their traditional knowledge and culture and improve their livelihoods at the same time. The need to develop rural non-farm activities for livelihood improvement was emphasised along with the need for micro-finance, including savings, not just credit, to help to develop these activities. Finally, Dr Roy emphasised the need to promote peace in mountain areas and that to secure peace we need to promote social justice, human rights, and the elimination of unequal power and development relations

The presentation of Dr Quamrul Islam Siddique emphasised the need for real regional collaboration and cooperation in addressing transboundary issues such as water resources management. He emphasised that integrated water resources management can solve many problems for the three interrelated river systems of the Ganges, Brahmaputra, and Meghna. The need for regional collaboration and cooperation is particularly relevant in the case of Bangladesh as the control, or lack of control, of water flows upstream, affect both floods and droughts in the downstream. Efforts such as ICIMOD's flood forecasting and country treaties, are now making progress in this direction.

Dr Hari Upadhyaya provided an insight into Economic Policies for Sustainable Land Use. He pointed out that sustainability is about people and how they collectively decide to manage their resources. Economic policies play a key role in this as they can either



promote or hinder sustainable land use practices depending on their nature. Policies need to promote sustainable land use systems and institutions like ICIMOD can help in this.

Dr Tone Bleie looked at the Institutional Dimensions of Sustainable Use of Mountain Resources and emphasised the need to look at the diversity, complexity, and political and economic environments that lead to conflict in mountain areas and the need to understand these deeply and thoroughly in a historical context. There is an especial need to understand the historical context of the formation of formal and informal institutions and states in the region. It is also very important to understand, and work with, women's groups in mountain regions, as often they are the agents of change

Finally, Professor Jamuna Sharan Singh discussed the need for Sustainable Management of Biodiversity. He emphasised the need for assessment and data collection on the immense biodiversity in the HKH region; identification of site specific threats and mitigation; sustainable use and value addition; restoration using appropriate interventions; conservation outside protected areas; scaling up of transboundary approaches and public participation; and appropriate methodologies.

The discussions focused on the issue of conflict in the region and the impact of globalisation on these conflicts. There was discussion on how to recognise the early warning signs of conflict, especially as outside influences occur rapidly and abruptly. There is a need for intervention at the early stages. The discussion also focused on the important issue of regional cooperation on issues such as water resource management. We now have the development of partnerships to address this but there is still much more to do, especially at the regional level

## **Working Session III: Securing Livelihoods**

*Chair: Dr Hans Gsaenger*

The keynote speech by Dr Mohan Man Sainju on Securing Livelihoods for Mountain People provided us with a review of past success and critical aspects for ICIMOD to improve upon. The suggestions made were that (i) the policy-making process be relevant and responsive to the needs of mountain areas, (ii) the nexus between poverty and environmental sustainability be recognised, (iii) institutions like ICIMOD be used to strengthen partnerships and collaboration in planning, achieving, and monitoring programmes, and (iv) it is important to make mountain knowledge and information accessible and usable.

The presentation by Dr Nyima Tashi on Sustainable Rural Development in Mountain Regions drew lessons from the Tibet Autonomous Region of China. Coping strategies were needed leading to sustainable development that entail a balanced and integrated approach; and systematic poverty assessment and poverty alleviation plans should be carried out. The need for assessment and promotion of niche opportunities and the comparative advantages of different areas was highlighted.

The presentation by Dr Rob Visser on Poverty and Environmental Linkages touched upon the close ties between environment and poverty and the context specific connection with gender. Some critical remarks were provided on the current debate, especially the marginal rather than central attention paid to gender, the apolitical character of analyses, and the lack of attention paid to institutional matters (culture, gender, governance) before planning activities.

The presentation by Dr Kamal Banskota on New Opportunities for Mountain Economics looked briefly at some of the emerging opportunities, and constraints and needs for their development. Factors such as improving physical access, access to improved technologies, markets, natural resource management, and an enabling environment were discussed.

The presentation by Dr Ruth Egger on Mountain People, Economic Benefits, and Biodiversity looked at the valuation of goods and services from the HKH, the prerequisites for achieving this valuation and promoting these goods and services, and the role of ICIMOD. The presentation pointed out the considerable under-utilised potential for mountain goods and services and suggested that investment be made in research, information and education, the women, men, and young people living in the mountains, and local conditions like infrastructure.

The subsequent floor discussion focused on the marketing problems of the Chittagong Hill Tracts and the realisation of the complementarity between the papers presented in the session. Accessibility has now been accepted as a critical factor in poverty alleviation, which was not the case two decades ago. Various suggestions were made for promoting securing of livelihoods for mountain people, and developing and promoting the potential of mountain goods and services. It was suggested lessons and coping strategies leading to sustainable development entailing a balanced and integrated approach be drawn from around the region, and that a built-in alarm system be developed to safeguard mountain societies from future negative impacts.

## **Working Session IV: Strengthening Cooperation and Knowledge Sharing**

*Chair: Dr J Gabriel Campbell*

Lyonpo Dr Kinzang Dorji's keynote address on Strengthening Cooperation and Knowledge Sharing (read out by Mr Sonam Rinchen of the Ministry for Works and Human Settlement, Royal Government of Bhutan) emphasised the relevance of ICIMOD to Bhutan, for example in terms of the challenges posed by global developments such as global warming. Institutions like ICIMOD can play a role through the continuous development of early warning and monitoring systems.

Dr Anne Whyte gave a provocative and challenging talk on the ten key characteristics of successful formal knowledge networks, including factors such as being purpose driven,

built on expertise, and requiring effective management and institutional commitment. They must be first and foremost communicating networks. They can only succeed if they engage the end users of the knowledge that they are creating.

Mr Shoaib Sultan Khan, founder of the Agha Khan Rural Support Programme (AKRSP), wanted rural incomes to double in the next ten years and a replicable model for poverty reduction. The successful strategy employed by AKRSP, with development coming from the bottom and not from the top, was found to be applicable in many contexts. The challenge is to get the backing of government without them interfering in the development strategy. The programme's success was because AKRSP was not a government programme. AKRSP has been successfully replicated nationwide. In Mr Khan's experience the time for 'feel-good' projects is over. The problem is not what to do, or how to do it, but how to scale it up. Organisations like ICIMOD need to show that they are effectively scaling up and reaching more of the 120 million poor in the region.

Dr Zbigniew Mikolajuk in his talk on Linking Knowledge Providers and Users pointed out that we have many mechanisms and operations for creating knowledge, but the main issue is how to get that knowledge to the people who really need it in a form that they can use. Knowledge is there, but it is not readily available or accessible. Farmers need knowledge, policy makers need knowledge, and our job is to deliver information to them in appropriate ways. Knowledge is the ability to take appropriate action. ICIMOD and its partners are both seekers and knowledge providers; it is a two-way exchange. It is important to find an effective means of delivering knowledge and how best to package knowledge for different audiences and needs.

Dr Eklabya Sharma discussed lessons learned from the Alpine Convention and their relevance for the HKH region and ICIMOD. Transboundary mountains face more challenges as they are governed by different political systems; cooperation is paramount. The Alpine Convention provides a valuable source of information about processes and possibilities for collaboration and cooperation in mountain systems like the Himalayas. However, each region needs its own approach, and regional cooperation does not necessarily require a convention and can be done at a lower level. ICIMOD has some good examples in its programme activities. Our experience shows that there has to be more political commitment and stewardship from regional countries to foster such cooperation. There is a need for policies and strategies for parallel pursuit; joint programmes at the national level interlinked by a regional umbrella; and for building of trust. Stronger cooperation may lead to a greater Himalayan convention in the future; in which case ICIMOD could be an implementation institution.

There was extensive floor discussion on the need for, and ways to, scale up. The key to scaling up is demonstration; suggestions were made to introduce demonstration sites like Godavari in the member countries. Another issue raised was language, as all of the deliberations and presentations at the Symposium had been in English. It would be good if information could be made available in local languages and in a way that is useful to grassroots organisations. Moreover, questions were raised about the provision of continual support, both financial and technical, to the networks set up by ICIMOD.

## Closing Remarks

*Chairman U Soe Win Hlaing, ICIMOD Board of Governors*

Madam Chairperson, distinguished delegates from the region and from abroad, Mr Kenneweg, Chairperson of ICIMOD's Support Group, and Dr Gabriel Campbell, Director General and staff of ICIMOD,

I am extremely honoured to be making a short closing remark at the end of what has been, in my view, a very successful Symposium.

Over the past one and half days, we have covered a huge range of subjects and came up with so many useful ideas and experiences from which we can draw valuable lessons for ICIMOD to guide its future research and development programmes.

We had an excellent inaugural address by Professor Bruno Messerli, which indeed set the scene very nicely for the Symposium. The keynote speeches and panel presentations have been of a very high quality and we are all better educated on the issues and challenges that our region, the Hindu-Kush Himalayas, is facing. Throughout the Symposium, there was an atmosphere of warmth and sharing among all of the participants and the core message that I personally received was that ICIMOD has a leading role to play in fostering cooperation, the sharing of information, and the dissemination of knowledge among our eight member countries. We have heard very encouraging remarks from representatives both of our regional governments and from the ICIMOD Support Group. I am confident that, with the healthy capital of goodwill and support that I witnessed here, ICIMOD will be able to meet the challenges ahead of it successfully.

Finally, I felt that the idea of having this Symposium as the first major event was an excellent one and has fully justified the grandeur of this new complex. The success of this Symposium indeed augurs well for better times to come for ICIMOD.

May I conclude by congratulating the Director General and all of the staff of ICIMOD for the wonderful arrangements and for organising this Symposium.

Thank you.

# **Annexes**



# **ANNEX 1: PROGRAMME 21<sup>ST</sup> ANNIVERSARY SYMPOSIUM**

(The Symposium was preceded by the formal Inauguration of the new ICIMOD Headquarters building.)

**Day 1: Sunday 5 December 2004, 9:00 am – 4:45 pm**

**INAUGURAL SESSION (11:25 – 12:00)**

Welcome by **Dr J Gabriel Campbell, Director General**, ICIMOD

Address by **U Soe Win Hlaing, Chair**, Board of Governors

Address by **Mr Jochen Kenneweg, Chair**, ICIMOD Support Group

Address by the **Honourable Minister Mr Bachaspati Devkota**, Ministry of Population and Environment

Keynote Address by **Professor Bruno Messerli**, Institute of Geography, University of Berne/MAB, Switzerland

Ushering to the Library and audience by His Majesty the King to the ICIMOD Board of Governors and the ICIMOD Support Group (with Refreshments)

Departure of His Majesty the King

**WORKING SESSION I: SECURING THE MOUNTAIN ENVIRONMENT (2:30 – 4:45)**

*Chair: Mr Egbert Pelinck*

## **Opening Remarks**

### **Keynote Speech: Securing the Mountain Environment**

*Dr Massimo Antoninetti*

## **Panel Presentations**

Impact of Global Warming and Climate Change on Mountain Ecosystems

*Mr R Rajamani*

Environmental Services and Upstream – Downstream Relationships in Pakistan

*Dr M Sharif Zia*

Securing Community Participation in Conservation

*Prof Xu Jianchu*

Geographic Information for Sustainable Mountain Development in the Hindu Kush-Himalayan Region

*Mr Basanta Shrestha*

## **Discussion**

## **Closing Remarks**

## **Day 2: Monday 6 December 2004, 9:00 am – 6:00 pm**

### **WORKING SESSION II: SECURING SUSTAINABLE USE OF MOUNTAIN RESOURCES**

(9:00 – 11:10)

*Chair: Mr Peter Gueller*

#### **Keynote Speech: Securing Sustainable Use of Mountain Resources**

*Dr Phrang Roy*

#### **Panel Presentations**

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

*Mr Quamrul I Siddique*

Economic Policies for Sustainable Land Use in the HKH Region

*Dr Hari K Upadhyaya*

Institutional Dimensions of Sustainable Use of Mountain Resources

*Dr Tone Bleie*

Sustainable Management of Biodiversity

*Prof Jamuna S Singh*

#### **Discussion**

#### **Closing Remarks**

**Tea**

### **WORKING SESSION III: SECURING LIVELIHOODS (11:25 – 1:30)**

*Chair: Dr Hans Gsaenger*

#### **Keynote Speech: Securing Livelihoods for Mountain People**

*Dr Mohan Man Sainju*

#### **Panel Presentations**

Sustainable Rural Development in Mountain Regions – Lessons from the Tibet

Autonomous Region of China

*Dr Nyima Tashi*

Poverty and Environmental Linkages: the Relationship between the Environment, Poverty, and Gender

*Dr Rob Visser*

New Opportunities for Mountain Economies

*Dr Kamal Banskota*

Mountain People, Economic Benefits, and Biodiversity

*Dr Ruth Egger*

#### **Discussion**

#### **Closing Remarks**

**Lunch**



## **WORKING SESSION IV: STRENGTHENING COOPERATION AND KNOWLEDGE SHARING**

(2:35 – 4:45)

*Chair: Dr J. Gabriel Campbell*

### **Keynote Speech: Strengthening Cooperation and Knowledge Sharing**

*Lyonpo Dr Kinzang Dorji*

### **Panel Presentations**

Learning from Global Knowledge Initiatives

*Dr Anne Whyte*

Identifying and Upscaling Successful Development Approaches

*Mr Shoaib Sultan Khan*

Linking Knowledge Providers and Users

*Dr Zbigniew Mikolajuk*

Lessons from the Alpine Convention Experience for the HKH Region

*Dr Eklabya Sharma*

### **Discussion**

### **Closing Remarks**

*Tea*

## **CLOSING SESSION (5:00 – 5:45)**

*Chair: Dr Anne Whyte*

Rapporteurs' Summary

Remarks by the Chair of the Board of Governors

*U Soe Win Hlaing*

Remarks by the Chair of the ICIMOD Support Group

*Mr Jochen Kenneweg*

Closing Remarks by Dr J. Gabriel Campbell, ICIMOD

### **Departure**

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