

Commemorating 25 years









ICIMOD and the Himalayan Region – Responding to Emerging Challenges

ICIMOD

FOR MOUNTAINS AND PEOPLE



About ICIMOD

The International Centre for Integrated Mountain Development, ICIMOD, is a regional knowledge development and learning centre serving the eight regional member countries of the Hindu Kush-Himalayas – Afghanistan , Bangladesh , Bhutan , China , India , Myanmar , Nepal , and Pakistan  – and based in Kathmandu, Nepal. Globalisation and climate change have an increasing influence on the stability of fragile mountain ecosystems and the livelihoods of mountain people. ICIMOD aims to assist mountain people to understand these changes, adapt to them, and make the most of new opportunities, while addressing upstream-downstream issues. We support regional transboundary programmes through partnership with regional partner institutions, facilitate the exchange of experience, and serve as a regional knowledge hub. We strengthen networking among regional and global centres of excellence. Overall, we are working to develop an economically and environmentally sound mountain ecosystem to improve the living standards of mountain populations and to sustain vital ecosystem services for the billions of people living downstream – now, and for the future.

**Commemorating 25 years of commitment
for mountains and people**

ICIMOD and the Himalayan Region – Responding to Emerging Challenges

Editor
Dr Golam Rasul

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Foreword

The International Centre for Integrated Mountain Development (ICIMOD) was established in 1983 with the dual mandate of reducing poverty and conserving the environment in the Hindu Kush-Himalayan (HKH) region – an area that stretches from Afghanistan in the west to Myanmar in the east, and from the Tibetan plateau of China in the north to the Ganges Basin of India in the south. Since its establishment, ICIMOD together with its national and international partners has been working to develop and provide integrated and innovative solutions for a multitude of problems encountered by the people of the region. From a small documentation and training centre, it has grown into a well recognised ‘mountain knowledge and learning centre.’

This year ICIMOD is celebrating its 25th anniversary, providing us with an opportunity both to look back and reflect, and to look forward and redefine the Centre’s role, responsibilities, and orientation. As a part of this, we invited selected scholars, development practitioners, and scientists from the region and beyond – some involved in the Centre’s development, others interested observers – to provide a commentary on different aspects of the Centre from their personal perspective. We are fortunate that most were able to contribute wholeheartedly at short notice; this publication with its diverse views, perspectives, and insights, is the result. The main purpose of this commemorative publication is to view ICIMOD and its work from a regional and global perspective. Twenty-five years is a long time, particularly considering that some of ICIMOD’s member countries are among the most dynamic economies with very quickly changing social, cultural, and economic parameters, and much has changed since ICIMOD was first conceived.

We extend our sincere thanks to all the authors for their valuable contributions, which will help in shaping ICIMOD’s future agenda as well as furthering its vision and mission of bringing well-being to the people of the HKH region and beyond while protecting the environment for the benefit of future generations. I would also like to sincerely thank the regional member countries, particularly the focal ministries; their continuous support and confidence has been the backbone for building up 25 years of experience. A special mention goes to our international sponsors; particularly Germany and Switzerland have been reliable and strong partners since the very beginning. Without their initiative and conviction, ICIMOD would probably never have taken off. With this support, ICIMOD was able to gradually gain the confidence of other core sponsors such as Austria, Denmark, Finland, Netherlands, Norway, and Sweden and gather increasing support from bilateral and multilateral agencies. The contributions have not only been financial, advice and technical support from these organisations has helped us to grow and develop our capacity to respond to the growing expectations. Finally let me express my sincere thanks to all the staff of ICIMOD. Their efforts and availability, commitment and perseverance, provide the backbone of the institution. In particular, I would like to thank Golam Rasul and the publishing team, whose dedication was essential in preparing this book.

We look forward to receiving continued support and guidance to the Centre in the days ahead, to help us as we work in the service of the people of the HKH region and beyond.

Andreas Schild
Director General, ICIMOD

Acronyms and Abbreviations

CGIAR	Consultative Group on International Agricultural Research
ECES	Environmental Change and Ecosystem Services
EU	European Union
GLOF	glacial lake outburst flood
GNP	gross national product
HKH	Hindu Kush-Himalayas/Himalayan
ICSU	International Council for Science
ICT	information communication technology
ICIMOD	International Centre for Integrated Mountain Development
IPCC	Inter-governmental Panel on Climate Change
IWHM	Integrated Water and Hazard Management
LTER	long-term ecological research
MEA	Millennium Ecosystem Assessment
MPF	Mountain Perspective Framework
MTAP	Medium Term Action Plan
NER	North Eastern Region
NGO	non-government organisation
PAC	Programme Advisory Committee
PAF	Poverty Alleviation Fund
QQR	Quinquennial Review
RMC	regional member country
SLPR	Sustainable Livelihoods and Poverty Reduction

An aerial photograph of a steep, forested mountain slope. The majority of the slope is covered in dense, vibrant green trees. In the center-left portion of the image, there are several terraced agricultural fields, appearing as lighter green and yellowish patches against the darker forest. A small, light-colored building is visible near the bottom of these terraces. The overall scene suggests a rural or agricultural landscape in a mountainous region.

1

Introduction

ICIMOD's Future Agenda: A Way Forward

Dr Andreas Schild, Director General, International Centre for Integrated Mountain Development

25 Years – a time for reflecting on the past and thinking about the future

Publishing a book on the occasion of a 25th anniversary raises a number of questions: Has ICIMOD fulfilled the expectations defined at the beginning? Twenty-five years: is it not enough? Can we still do what we have not managed to do over the last 25 years? Celebrating such an important anniversary implies that ICIMOD continues: so what in this case is its future role?

We have posed a series of questions to very prominent authors who have been at the origin of the Centre, have accompanied its evolution, or have been critical observers. The 25th anniversary also provides us with a unique opportunity for the management to reflect on the role, potential, and future tasks of the institution. Our bold assumption is that ICIMOD is more required than ever before. What is the rationale for this assertion?

Twenty-five years ago, the Hindu Kush-Himalayas represented an isolated barrier dividing the continent. Today, thanks to the enormous growth of the economies of China and India, and to a lesser extent of Pakistan and Bangladesh, the Himalayan chain is considered a system with corridors for the exchange of goods and services. The passes and valleys are used for road construction and railway projects. The geo-political situation within Asia has changed dramatically. With climate change and the accompanying increase in temperatures and irregularity of precipitation patterns, the Himalayas have become of central concern in terms of the availability of water and the provision of ecosystem services. The products of the mountain system not only impact on the livelihoods of the 200 million mountain inhabitants, but also directly affect the food security and economic development of the 1.3 billion people living downstream.

These factors have substantially changed the conditions for ICIMOD: whereas 25 years ago the initiative was taken by international institutions and the donor community, today the regional member countries of ICIMOD have taken an initiative in a context in which FAO, IUCN, and UNEP have no specific mountain policy. The Government of India has accepted the National Action Plan for climate change, with a special chapter on the Himalayas; the National Planning Commission has asked for a state of the art report on the mountain states; and the Ministry of Environment and Forest has created an advisory committee on mountain development. Similarly, for the first time in

history, the Government of PR China has organised a high level conference in Beijing on a strategy for sustainable mountain development. These are just a few examples. ICIMOD cannot pretend to have provoked these developments; they are a product of internal political processes. What we can say is that the conference in China has been convened and organised by the Chinese ICIMOD committee. The creation of an advisory committee for mountain development in India goes back to the initiative of a former staff member of ICIMOD. In other words, there is a clear footprint for ICIMOD.

This is confirmed by the feedback ICIMOD has received from the regional stakeholders. The issue is not whether the ICIMOD agenda is relevant; the question is rather whether ICIMOD is in a position to deliver and to respond to the expectations of its member states.

ICIMOD: changing expectations, new challenges

ICIMOD has always seen its role as one of continuous adjustment to new requirements and expectations. This permanent challenge of adaptation has made its mission subject to permanent questioning. This refers certainly to the role of the organisation, but also to the perception by the mountain population, the regional governments, and the international community of the Hindu Kush-Himalayan mountain system. The adjustment has not always followed a regular steady pattern. Sometimes there have been jumps and inconsistencies. Looking back and drawing lessons from recent developments, we think the following process can be observed.

Mountains: from a peripheral to a central concern

When the Centre was established, mountains were clearly on the periphery of development thinking. Priority was given to the so-called high potential areas of short-term investment, structural adjustment, macro-economic stabilisation, and human rights. Little attention was paid to mountain issues by the world development agencies, the regional governments, and the communities. Mountains were a concern for a few mountain thinkers and lovers.

Nevertheless, over the last few decades mountains have become of growing international concern. The Rio conference in 1992 and the International Year of the Mountains 2002 are proof of the changing mood. The international development agenda, however, remains dominated by global trends. Concerns for the mountains have been overshadowed by global topics calling for border to border national programmes. The mountains have become the subject of international declarations without substantial change of investment priorities.

The findings of the IPCC and the rising environmental awareness and concerns for global warming, climate change, and biodiversity loss, have been a wake up call. Changes in livelihoods systems and economies have made it evident that mountain areas merit special attention as highly fragile systems and reserves of freshwater. Mountain issues are now, we hope, achieving high international political and scientific visibility.

From donor driven to regional ownership

Initially, the idea of establishing ICIMOD came from a few scientists and development practitioners. The promoters were experts and donor representatives, and ownership was mainly with scientific communities, researchers, and international organisations. The programmes and projects were largely conceived and designed following the initiative of the international community and scientists at ICIMOD, and were then implemented with the support of the regional member countries (RMCs). As a result, participation from the RMCs was low and their ownership was rather weak.

This operating principle has changed significantly in recent years. The regional countries have built up institutions and are funding their own programmes. ICIMOD's programmes and projects are now prepared through consultation with relevant partner organisations in the RMCs. They take the lead and implement the programmes with the Centre adding value in their activities by bringing regional and international perspectives, views, and options. The RMCs now not only support the Centre, they have developed their own mission, vision, and activities. All the RMCs have increased their financial and in-kind contribution to ICIMOD significantly in recent years. In addition there are a growing number of programmes in the frame of an ICIMOD vision. Such programmes are funded by the national governments directly.

From technological solutions to policy options

Initially, the orientation of the Centre was technology biased. The focus was on generation and transfer of technologies such as soil conservation, green roads, and alternative energy. The socio-cultural aspects and economic dimensions remained on the sidelines. In the meantime these technologies have been largely mainstreamed. The emergence of the NGO world, particularly since the early 90s, has absorbed and further developed the technological dimensions. ICIMOD has been asked to shift its focus to strategic and policy aspects and issues. The Centre has been asked to change gradually, moving from a techno-centric to a people centric approach, providing solutions and also creating an environment for better adoption of suitable technologies and options. The stakeholders expect a clear impact on development issues and the human dimension. In view of these strategic changes, the nature of partnership has also changed, moving towards multi partnerships including those with local NGOs, grass-roots organisations, government ministries, national planning commissions, civil society, regional and global research and think tanks, and universities.

From direct implementation to facilitation

The emergence of strong, mountain-focused organisations and national programmes calls for other changes in the Centre's operating principles and modus operandi. Instead of direct implementation, ICIMOD's role is now more supportive and advisory. The Centre is becoming more of a regional learning and facilitating platform. It will gradually function as a regional think-tank on mountain

development and environmental issues. Scaling up responsibility lies primarily with the RMCs. The Centre provides technical support for piloting, testing, and scaling up new knowledge, options, and methodologies.

Emerging challenges: new perspectives

The nature of the problem has changed since ICIMOD was established, posing new challenges and demanding a new vision, strategy, and orientation. Initially, the Centre started from the concern for rural development. The impression then was that soil erosion is a major cause of poverty and environmental degradation. The issue was thus within the region and the problem was considered to be caused by internal forces leading to unsustainable land use. Now, with the emerging issue of climate change, the fragile Himalayan environment – the water tower of Asia – has been seen to be under threat. The Hindu Kush-Himalayan mountain system constitutes a set of challenges as a result of its specific geological, socio-cultural and geo-political situation. At the same time it is part of a regional and global context. This global context calls for a new perspective, new vision, and new focus. While previously, local technical solutions could suffice, it now requires a much broader effort, regional collaboration, and global solidarity. Mountain systems have to be seen in their upstream-downstream relations and with a vision that encompasses the downstream river basins. There is now a need for an optimal balance and mix between local, national, regional, and global responsibility.

While the need of the day is for regional cooperation to enable better management of transboundary resources, sharing of real time hydro-metrological data, and development of joint plans and programmes to better harness and address common concerns and challenges, the prevailing tradition is to handle these issues bilaterally, rather than regionally. Bringing a regional perspective, and facilitating regional dialogue and negotiation, is the much more challenging task that lies ahead. Moreover, in order to promote regional dialogue, it is necessary to have reliable scientific data that can be collated and compared across the region. But, there is little mountain specific scientific data, few models, and insufficient understanding available in the region. As such, the challenge is to reduce scientific uncertainties.

In addition, in order to facilitate adaptation to climate change and its consequences, continuous adherence to the mountain perspective and focus is needed. Even if proper mitigation measures are taken, it will take about 100 years to respond properly to climate change, as suggested by the Inter-governmental Panel on Climate Change (IPCC). Therefore, adaptation measures are important in order to adjust during this longer-term period. But, adaptation is location specific and needs to be tailored to local conditions. Blanket measures for the entire HKH region will not work. The challenge is thus to develop tailor-made adaptation measures for the mountain communities of the HKH region.

The stakeholders' view

The reflections and insights of the scholars and development practitioners in this publication indicate both the evolution and development of the Centre, new global and regional challenges, and possible new roles for ICIMOD. The contributions were invited from authors who had had some association with ICIMOD in the past and were known for their independent opinion.

The publication is divided into five sections: the first is this Introduction; the second looks at the 'Regional Member Countries' Commitment to a Common Future', the third reviews the 'Expectations and Role of ICIMOD', and the fourth and fifth sections focus on 'Meeting New Challenges' from a scientific and from a development perspective. Five Annexes provide details of the contributors, ICIMOD milestones, a list of Board Members, a list of Director Generals and Regent, and a list of ICIMOD sponsors and donors.

In the second section, the eight regional members of the ICIMOD Board of Governors in 2008, representing the eight regional member countries, provide messages reflecting their strong interest and commitment to the Centre as well as their expectations.

In the third section on the 'Expectations and the Role of ICIMOD', three papers indicate the global and regional context and issues at the time the Centre was established, the expectations at that time and how the Centre responded to the issues, the experiences that have been gained, the lessons learned, and how the response could have been better. The first paper on 'The International Centre for Integrated Mountain Development: From an Ignored Idea to a Global Voice' is by Dr Klaus Lampe from Germany who was one of those who conceived the idea of establishing a mountain centre in the Himalayan region in the early 1970s. He, along with a few other mountain lovers, made constant efforts to establish the Centre. He describes vividly how the idea emerged, the global context, the expectations, and how the Centre itself was created, as well as how the global context has since changed and the implications for ICIMOD's future role and responsibility. Dr Lampe's paper is complemented by a contribution from another pioneer thinker: Mr AD Moddie from India. In his paper on 'Strategic Changes in the 21st Century: Remodelling ICIMOD for the Hindu Kush-Himalayan Region', Mr Moddie takes a forward-looking approach, starting with an analysis of how the perspectives and realities have changed since the establishment of the Centre in 1983, and then discussing how ICIMOD should reorient and remodel itself in order to respond to the new challenges and opportunities offered by the global and regional changes. The final paper in this section on 'The Evolution of ICIMOD – From Concepts to Good Practices' is a joint contribution from three authors. Dr Narpat S Jodha, a prominent mountain thinker, has critically examined the role and contribution of the Centre from a broader perspective. Dr Ram P Yadav, the first Deputy Director of ICIMOD, and Dr Madhav B Karki, the present Deputy Director General of the Centre, together look at how the Centre has evolved over the years and its role and responsibilities in response to global and regional changes.

In the fourth section, five renowned scientists and academics suggest how ICIMOD should respond to future challenges from a scientific perspective. Professor Bruno Messerli, a leading thinker in mountain science, describes in his paper 'The Hindu Kush-Himalayan Region – Common Goods or Common Concerns' the universality of science, the role of the scientific community, and the role of political authority in responding to the common challenges faced by the HKH region and in addressing the 'common concerns' for building a common future for sustainable development. In a similar vein, Professor MS Swaminathan, a renowned scientist from Asia, highlights in his paper 'Towards a Better Common Present', the importance of conservation of the Himalayan ecosystem, as the status of this ecosystem determines the fate of Indo-Gangetic agriculture, which is the breadbasket of India, Bangladesh, and Nepal. As anthropogenic pressures accelerate the deterioration of Himalayan soil, water, and biological and non-biological resources, he argues for mainstreaming the social dimension in development strategies. In his words, "there can be no better common future, without a better common present". Professor SP Singh, former Vice Chancellor, HNB Garhwal University, India, highlights in his paper 'Preparing the Himalayas to Meet the Challenges of Climate Change: an Area for ICIMOD to Take a Lead' the changes in the Himalayas during the last 25 years and their role in global climate change. He also draws attention to the need for scientific data in order to enhance understanding, and sees ICIMOD's role as a facilitator and networker to connect the regional research and academic institutions. Finally, Professor Sun Honglie, a renowned scientist and academician, and Professor Ouyang Hua, both from the Chinese Academy of Sciences, focus in their paper 'The Environment of the Tibetan Plateau and its Sustainable Development' on the need for long-term scientific studies for better utilisation of resources, environmental protection, and sustainable development of the Tibetan Plateau, an ecological umbrella for east and South Asia.

In the fifth and final section, four development practitioners and policy makers discuss responding to future challenges from a development perspective. Dr Zafar Altaf, former Federal Secretary, Government of Pakistan, highlights in his paper 'Climate Change and the Hindu Kush-Himalayan Region: Implications for Agriculture, Food, Poverty and Livelihoods' the nexus between environment and development, including climate change, food security, and livelihoods. He also reminds us of ICIMOD's contribution in facilitating technologies, with the examples of seabuckthorn, sloping agricultural land technology (SALT), and angora rabbits in northern Pakistan. Eng Quamrul Islam Siddique of the Global Water Partnership and former Secretary, Government of Bangladesh, and Eng Reba Paul, also of the Global Water Partnership, highlight in their paper 'Impacts of Climate Change on Himalayan Water and the Need for Regional Transboundary Cooperation' the need for regional cooperation and sharing of hydro-meteorological data among countries for disaster risk reduction and sustainable management of transboundary water resources. They see ICIMOD's role as being a catalyst in facilitating regional cooperation in water resource management and sharing hydro-meteorological data among the riparian countries. Dr RS Tolia, former Chief Secretary, Government of Uttarakhand, India in his paper 'Creation of ICIMOD and its Expected Role in Addressing Regional Environmental and Developmental Challenges' raises the question of whether ICIMOD has succeeded in rendering itself irrelevant to the HKH region. As a member of an

independent evaluation team (Fourth Quinquennial Review Panel of ICIMOD), he was able to explore the answers from an independent perspective. He considers that while ICIMOD has made progress in certain technological areas, regional ownership of its work has remained weak, and this hinders scaling up of the tested knowledge and good practices as well as sustainability of the achievements. He suggests taking a more regional and less bilateral approach, as well as enhancing understanding of the priorities and policies of the RMCs. Dr Pema Gyamtsho, Hon'ble Minister for Agriculture, Royal Government of Bhutan, and Mr Nawang Norbu, Ministry of Agriculture, Bhutan, discuss in their paper 'Linking Mountain Communities and Ecosystem Services: Options for Sustainable Livelihoods' the stewardship role played by mountain communities and argue for rewarding them for the environmental services they provide in the form of water, energy, biodiversity, carbon sinks, and recreation, thus contributing to both sustainable livelihoods and environmental conservation.

ICIMOD's future agenda based on 25 years of learning

Given the growing interest in mountain issues among the RMCs and the changing regional and global contexts, the question arises as to what could ICIMOD's future role be, how it should function, and how it should meet the growing expectations of the regional and international stakeholders. The views expressed by independent scholars from within and outside the region, as well as by the regional and international stakeholders, indicate that ICIMOD will have an expanded and challenging role ahead as a result of the impacts of global warming and climate change on the Himalayan ecosystems that affect the lives of 1.3 billion people, and call for collective action at regional level to ensure sustainable development. No single country can address effectively such issues as crises in freshwater provision, increasing natural hazards, deterioration of the regional environment, degradation of the Himalayan ecosystem, rapid melting of ice, loss of biodiversity, persistent poverty and vulnerability, and human security. Concerted efforts from all countries of the region and support from global development partners are needed to address these challenges. The changing context offers an increased role for independent regional organisations like ICIMOD. Based on 25 years of experience, and taking the regional and international stakeholders' perspective into account, we see the following prospective role for ICIMOD in the near future. The suggestions are by no means complete, however, and will be subject to further discussion and thought.

- 1 **Promoting the mountain agenda.** While the role of mountain systems as a provider of essential services to the global community is increasingly recognised, the relevant international organisations have not yet set priorities in support of mountains. ICIMOD can play a critical role in raising awareness and drawing public attention to the Himalayan ecosystem and environment in order to enhance regional and global commitment and action to support adaptation processes in the mountains and strengthen upstream-downstream relationships.

- 2 Facilitating regional cooperation.** While the need for transboundary regional cooperation has now been realised, implementation is a real challenge given the geo-political situation. ICIMOD as a non-political regional organisation is in a unique position to support and facilitate regional dialogue and cooperation among the RMCs through provision of relevant data, knowledge, and understanding, as well as serving as a platform for exchange of ideas.
- 3 Facilitating information and knowledge sharing for disaster risk reduction.** The communities in the HKH region and downstream flood plains are prone to excessive natural disasters including landslides, floods, droughts, and glacial lake outburst floods. Reducing the risk of natural disasters is critical for poverty alleviation and sustaining development efforts. ICIMOD can play the role of a catalyst in sharing information and realtime data in order to reduce such risks and vulnerabilities.
- 4 Filling the missing link and reducing scientific uncertainties.** There is a lack of hard core facts and figures at a regional scale, which hinders proper planning and decision-making. The data generated by national and international institutions in the HKH region are often partial, fragmented, and scattered. Often different countries use different methods and standards for data collection and analysis. This makes interpretation of hydro-metrological data at a regional scale difficult. Even when compatible data are available, they are often not shared in time due to procedural and other complications. Because of this dearth of consistent scientific data, the IPCC report (2007) categorises the HKH region as a 'white spot' on the global climatic map. ICIMOD can play a significant role in reducing the scientific uncertainties by creating regional databases on different aspects of the mountain regions as well as strengthening regional cooperation for timely sharing of data and information in order to facilitate proper planning and decision making by the RMCs and international organisations. ICIMOD can also contribute by developing and tracking the trends in key indicators related to temperature, melting of snow, water availability, environment, hydrology, meteorology, and adaptation to climate change.
- 5 Valuing mountain ecosystem services.** Although, recently, awareness has been increasing about the role of the Himalayan mountain system, including water, watersheds, and rangelands, as a provider of freshwater and other ecosystem services, translating this into policies and actions has remained elusive due to poor understanding about the real value of the services provided. By providing an estimated economic value for these services, ICIMOD will facilitate promotion of payments for the environmental services provided by the mountains with a view to protecting these services as well as enhancing the livelihoods of the poor mountain communities who are the primary users, guardians, and managers of such resources and services.

6 Facilitating cross-country learning in adapting and mitigating climate change effects.

Adaptation to global and regional changes requires knowledge, understanding and good practices. Although much valuable knowledge is being generated by the HKH institutions, these are mostly limited to their own country's territory. ICIMOD can play an important role in facilitating cross-country learning for better adaptation and mitigation of climate change, by documenting and disseminating good practices

7 Adapting global knowledge for the HKH region. Knowledge, experience, and wisdom generated in different parts of the world including the Alps, the Andes, and the Rocky mountains, might have great relevance for the Himalayas. However, knowledge generated elsewhere may not always directly fit the HKH region due to differences in socioeconomic conditions. Customising knowledge to the HKH conditions can facilitate their application in the region. ICIMOD can work as a bridge between global and regional knowledge centres to customise global knowledge to match the HKH conditions and package and disseminate it for application in the region.

8 Building closer strategic partnerships within and beyond the region. ICIMOD is a small organisation. To play its expected role, it will continue to build strategic partnerships with relevant organisations within and beyond the region with a view to promoting symbiotic relationships to deal better with the multiple challenges confronting the HKH region and the implications at global level.



2

The Regional Member
Countries – Commitment
to a Common Future

Afghanistan

Message from HE Eng Ghulam Mostafa Jawad

Member, ICIMOD Board of Governors; Deputy Minister, Ministry of Agriculture, Irrigation and Livestock, Government of Afghanistan



Afghanistan is a less developed mountainous country that has suffered greatly over the last twenty-five years of war, devastation, and instability. Agriculture and natural resource utilisation have formed the basis of our economy for centuries and are still the most important sources of livelihood for over eighty-five per cent of people. The years of conflict have set Afghanistan back and removed us from opportunities to develop our agriculture and forestry and water resources, which many other Himalayan countries have been able to do. As a mountainous country, Afghanistan has special needs and opportunities that are different from those of the plains.

As an organisation established to share knowledge among mountain countries, ICIMOD has helped to integrate and connect Afghanistan with its mountain neighbours, thus facilitating exchange of scientific knowledge and cooperation in order to deal with natural disasters and environmental degradation.

ICIMOD can play an important role in helping Afghanistan to acquire up-to-date scientific knowledge, specific to our mountain context, to make our agriculture and natural resources more productive. This is increasing in importance as climate change is now affecting the amount and timing of rain and snow and this is likely to require us to make further adjustments in the future.

I have been pleased to be associated with ICIMOD over the last seven years. During this time Afghanistan has made remarkable progress in rebuilding the government and development services. However, we realise that there is much more to be done. We very much welcome ICIMOD's cooperation in our efforts to rebuild and develop Afghanistan. We are happy to take up our membership in this important organisation, but are also impatient to see a higher level of activity here to bring real development to the country. We also welcome ICIMOD's role in helping Afghanistan to become more active in the Hindu Kush-Himalayan region.

I congratulate ICIMOD on the occasion of its Silver Jubilee and look forward to a strong and perpetual partnership in the future.

Bangladesh

Message from Mr Shaikh Altaf Ali

Chairperson, ICIMOD Board of Governors; Secretary, Ministry of Chittagong Hill Tracts Affairs, Government of Bangladesh



I am very pleased to know that ICIMOD is celebrating its 25th Anniversary. On behalf of the Government of Bangladesh, and myself, it is indeed a pleasure to extend greetings and congratulations to ICIMOD on this occasion. ICIMOD was established in 1983 with a dual mandate to improve the lives of mountain communities in the Himalayan region and to conserve the mountain environment. Since then, ICIMOD has travelled a long way. From a small documentation and training centre, it has grown into a well-recognised 'mountain knowledge and learning centre'.

This special celebration provides us with an opportunity to reflect upon the many and varied contributions made by ICIMOD over the last 25 years. ICIMOD, with its national and international partners, has been working to develop and provide integrated and innovative solutions to the multitude of problems encountered by mountain people. ICIMOD has also accumulated valuable experience over the years. Several technologies and options have been developed, tested, and demonstrated by ICIMOD together with its partners and are now well accepted. Their impact, however, has remained limited as widespread adoption could not be facilitated.

Development experiences and wisdom generated over the years suggests that no solution can be sustained or scaled up until it is owned by the direct beneficiaries. I am glad that ICIMOD has rightly recognised that in order to enhance the relevance and effectiveness of its efforts, it needs to be 'owned' by its eight regional member countries (RMCs). ICIMOD recently formed a Board Executive Committee with a view to engaging the RMC Board Members more intensively in providing strategic inputs, supervision, and guidance to the Centre. Its new Medium Term Action Plan (MTAP II 2008-12) was also prepared in detailed consultation with the agencies concerned in the RMCs in order to align ICIMOD's work with their needs and priorities. These are undoubtedly steps in the right direction. However, to take it further, ICIMOD's learning, knowledge and development efforts need to be anchored in appropriate institutions in the RMCs so that the knowledge and good practices that evolve can be sustained and scaled up.

Of course, ownership and commitment are interrelated. Strengthening ownership requires stronger commitment from all the RMCs. Ownership needs to be translated and reflected in joint plans and programmes, as well as by scaling up good practices by integrating them into government plans and programmes.

Bangladesh has participated continuously and supported ICIMOD's activities since the inception of the Centre. Bangladesh has also recently significantly increased its financial and in-kind contribution to ICIMOD. This not only reflects Bangladesh's increased ownership, but also its strong commitment to ICIMOD's mission, vision, and activities. On behalf of the Government of Bangladesh, I would like to renew our strong interest and commitment to ICIMOD and welcome any endeavours that support the lives and livelihoods of the people of Bangladesh in general, and those of the Chittagong Hill Tracts in particular.

As Chairperson of ICIMOD's Board of Governors during this important event, I recognise the valuable financial and technical support from all the regional member countries, as well as from the International Support Group. I believe that this support will continue and further increase given the Centre's growing role and value to the region, as well as to the world.

A silver jubilee is certainly a cause for celebration. On behalf of the ICIMOD Board of Governors, please accept my best wishes for a joyous celebration. I believe this event and this special publication on 'ICIMOD and the Himalayan Region: Responding to Emerging Challenges' will contribute to raising awareness of ICIMOD's work and advance the vision, mission, and agenda of the Centre.

Bhutan

Message from Mr Sherub Gyaltshen

Member, ICIMOD Board of Governors; Secretary, Ministry of Agriculture,
Royal Government of Bhutan



Climate change and its effects are of great concern and pose a serious challenge to small, landlocked economies like Bhutan, whose economic development is highly dependent on climate sensitive sectors such as agriculture, forestry, and hydropower. Climate change seems to take place at a much faster rate in the mountains, where the impacts are more visible than anywhere else, especially as a small change in temperature is enough to change snow to water. This phenomenon has a huge impact on the stable supply of water for drinking and for hydropower generation. The climate has become more unpredictable with very high intensity rains and more extreme frost and hail. Rainfall patterns have also changed.

The Hindu Kush-Himalayan mountains and their glaciers serve as a water reservoir, feeding Himalayan rivers on which up to three billion people depend for food and energy. Himalayan glaciers are retreating at a faster rate than the world average and are reported to be thinning by 0.3 to 1 metre per year.

Today, poverty in Bhutan stands at 23% and is mainly a rural phenomenon. It is the poor who are most vulnerable and who will bear the brunt of climate change. Water resources continue to be threatened, not only water for irrigation, but even for drinking. While some places experience drought, others suffer from flash floods. As temperatures continue to rise and glaciers melt at a faster rate than ever, glacial lake outburst floods (GLOFs) are a constant threat in Bhutan. New pests and diseases appear every year and ravage the crops that used to fetch good cash incomes for our farmers, affecting the livelihoods of rural women and men.

Can ICIMOD rise to the challenge?

ICIMOD, as the only international centre devoted to integrated mountain development, has daunting challenges to face, as well as opportunities, in preparing mountain people to be resilient and adapt to the global phenomenon of climate change.

The Ministry of Agriculture, Royal Government of Bhutan takes this opportunity to reconfirm to ICIMOD its assurances and commitment to the success of ICIMOD's noble programmes in its focus areas.

China

Message from Professor Ding Zhongli

Member, ICIMOD Board of Governors; Vice President, Chinese Academy of Sciences (CAS)



A Stronger Strategic Partnership between China and ICIMOD for the Next 25 Years

As an independent international research and knowledge centre, the International Centre for Integrated Mountain Development (ICIMOD) serves eight regional member countries in the Hindu Kush-Himalayan (HKH) region, with a clear mission to facilitate global environmental protection and the conservation of mountain ecosystems. Since its inception 25 years ago, the centre has made many contributions to the promotion of mountain research, regional resource development, eco-environmental protection, and sustainable development. It has committed much effort to the improvement of people's living standards and sustainable development in the HKH region, as well as accumulating knowledge and experience for sustainable development.

Being a founding member of ICIMOD, China has been actively collaborating with the Centre in achieving its various goals. Since 2006, China has doubled its annual financial contribution to ICIMOD from US\$ 45,000 to US\$ 100,000. Additional aid of US\$ 100,000 was also provided for the construction of ICIMOD's new headquarters. In recent years, ICIMOD's activities conducted in China, and Chinese engagement in the activities of ICIMOD and of other regional member countries (RMCs) have increased significantly. Over 30 Chinese professionals have contributed their knowledge and expertise as full-time staff of ICIMOD during the past quarter century. More than 300 Chinese researchers have been invited to carry out cooperative research and engage in other activities organised by ICIMOD such as international seminars and training courses. These activities cover a wide range of fields, including water and soil conservation, mountain agricultural development, disaster control, remote sensing and GIS applications, rangeland management, watershed management, shared management of natural resources, and biodiversity protection. In order to further develop and strengthen collaboration and communication with RMCs under the guidance of ICIMOD, the Chinese Academy of Sciences (CAS), the key partner of ICIMOD in China, set up the Chinese Committee on ICIMOD (CNICIMOD) in October 2006. ICIMOD highly praised its establishment and the former Director General, Dr J Gabriel Campbell, made a special trip to the Chengdu Institute of Mountain Hazards and Environment, CAS, to officially launch the opening of the CNICIMOD Secretariat. Dr Andreas Schild also visited the CNICIMOD Secretariat after assuming the post of Director General of ICIMOD. CNICIMOD has played an important role in organising and coordinating various activities for ICIMOD since its inception.

China is also a country with nearly 70% per cent of its land mountainous. Of the mountainous areas under the direct concern and investigation of ICIMOD, about half are located in China, including the Tibet Autonomous Region, Qinghai Province, Yunnan Province, Xinjiang Uygur Autonomous Region, and part of Sichuan Province and Gansu Province. The Chinese Government has attached much significance to the study and management of these areas and has committed much effort to achieve poverty alleviation, eco-environmental conservation, and the sustainable development of these regions. The new development strategy of ICIMOD focuses on the integrated management of water and hazards, environmental change and ecosystem functions, and sustainable livelihoods and poverty reduction. All of these priorities resonate very well with those of China. China and the Chinese Academy of Sciences will continue to support ICIMOD in relation to the study and tackling of global climate change challenges and the protection of ecosystem security for the benefit of all the people in the HKH region. It is believed that the following are the key areas for future cooperation between China and ICIMOD: integrated management of river basins and watersheds; eco-agriculture in mountain regions including rangelands and sloping farmlands; forest management; knowledge-sharing and technology transfer; hazard control and reduction; and sustainable development.

I am particularly pleased to note that ICIMOD in its new strategy has reiterated its role in promoting mountain research and cooperation in the HKH region. I believe that ICIMOD will prove to be a helping hand and valuable platform for its RMCs, while the RMCs will continue their commitment to the development of ICIMOD and take ICIMOD as their own organisation. I am looking forward to an even stronger partnership between ICIMOD and its RMCs, and with the strong support of ICIMOD networking, closer links and cooperation among member countries.

In conclusion, I would like to extend my warmest congratulations to ICIMOD for its 25th Anniversary and the Jubilee publication on behalf of the Chinese Academy of Sciences and a regional member country.

India

Message from Mr Vijai Sharma

Member, ICIMOD Board of Governors; Secretary, Ministry of Environment and Forests, Government of India



It is a matter of great satisfaction that the International Centre for Integrated Mountain Development (ICIMOD) will soon be commemorating its 25th Anniversary. This is an opportunity for ICIMOD to reflect on its experience, draw lessons from the past, and consolidate its framework of action for the future in the light of its objectives.

In India, the G.B. Pant Institute of Himalayan Environment & Development (GBPIHED) is the nodal institute for ICIMOD. GBPIHED and ICIMOD will soon be signing a memorandum of understanding to provide an institutional mechanism for undertaking mutually beneficial activities in the Indian Himalayan Region.

ICIMOD has indeed emerged as a significant knowledge centre for learning and information exchange, and we in the Ministry of Environment and Forests look forward to further building our association with a view to enriching the lives of local communities.

I wish ICIMOD all success in its endeavours.

Myanmar

Message from Professor Kyaw Htun

Member, ICIMOD Board of Governors; Deputy Director-General, Planning and Statistics Department, Ministry of Forestry, Government of Myanmar



I feel honoured and privileged to be able to contribute my thoughts and insights to ICIMOD's Silver Jubilee publication. The Earth on which we live was originally endowed with abundant natural resources. Lands were fertile, water and air clean, and forests green – the environment was uncontaminated. However, these precious natural resources have been used

beyond their capacity and in an unsustainable manner. As a result, lands have been degraded and forests have deteriorated and been converted into non-forest lands. The environment has been seriously affected by the pollution of land, water, and air. To make matters worse, some natural resources are disappearing forever from our planet, mainly due to anthropogenic activities. Today, we are faced with unprecedented environmental challenges, which could threaten the existence of human beings on this planet if they are not wisely resolved. Countries throughout the Hindu Kush-Himalayan (HKH) region are also being confronted with the challenge of maintaining their forest resources in the face of increasing demands, both for land and forest products. About 60% of the land area in the greater Himalayan region is rangeland, which is threatened by land degradation and desertification. Mountain poverty is exacerbated by environmental change.

At the 1992 UN Conference on Environment and Development held in Rio, governments were urged to pursue the National and Subregional Sustainable Development Strategy. At the Rio+5 Summit in 1997, the National Sustainable Development Strategy (NSDS) was reaffirmed as an important mechanism for countries to achieve sustainable development. At the UN Millennium Declaration held in 2000, heads of state and governments again reaffirmed their commitment to the principles of sustainable development and the other provisions of Agenda 21. The 2002 Johannesburg Plan of Implementation called upon countries to take immediate steps towards the formulation and elaboration of the NSDS, and to begin implementation by 2005.

In the 25 years since its inception in 1983, ICIMOD has become a well-established international institution. At this juncture, we need to evaluate to what extent the organisation has fulfilled its objective to promote the development of an economically and environmentally sound mountain ecosystem and to improve the living standards of mountain populations. Based on the experiences gained and lessons learned during the last 25 years, I believe that ICIMOD can streamline its future activities and programmes. ICIMOD has defined its vision, 'that the mountain population of the greater Himalayas enjoy improved wellbeing in a sustainable global environment', and its mission, 'to enable and facilitate their equitable and sustainable wellbeing by supporting sustainable mountain development through active regional cooperation'. Building capacity, raising awareness, and sharing experiences and lessons among the regional member countries is vital to be able to fully take part in the agenda and programmes of ICIMOD. The quest for synergy is the main driver needed to achieve ICIMOD's targets and goals.

Nepal

Message from Professor Pitamber Sharma

Member, ICIMOD Board of Governors, and Vice-Chair, National Planning Commission, Government of Nepal



I feel privileged to be able to participate in the Silver Jubilee Celebrations of ICIMOD. The Centre was established in 1983 to address two major interrelated concerns: the deteriorating environment of the Hindu Kush-Himalayan mountains, and the growing impoverishment of the region's people. ICIMOD was set up to help address these concerns through development of an economically and environmentally sound mountain ecosystem and improving the living standards of the mountain populations, in the present as well as in the future.

The challenges that were identified 25 years ago are still as real and imposing. Only the context, in terms of the trends that are unfolding, and in terms of our understanding of the problems, has changed somewhat. For ICIMOD it is a time for reflection. What has ICIMOD achieved in developing an economically and environmentally sound ecosystem in these mountains, and how has ICIMOD contributed to improving the living standards of mountain people? What are the lessons to be learned, and how are these lessons to be utilised in charting the course ahead? To provide simple answers to these questions is not easy. The scale of the problem and the extent of the HKH region are too large for a small institution like ICIMOD to make a visible impact. With the hindsight of a former professional member of staff, I believe that ICIMOD's strength lies in its capacity to utilise cutting-edge knowledge for the understanding and analysis of the problems of the environment, resource use patterns, and human livelihoods; in its use of partner institutions in identifying the gaps and in influencing policy orientations; in building up national capacities through training and experience sharing; and in promoting small-scale problem solving activities with potential for scaling up by national institutions. As it comes of age, ICIMOD should be reflecting on its achievements in these areas, and the strategies to make these achievements sustainable.

Global warming and climate change add a new dimension to our understanding of environmental and related issues and bring to the fore the complexity of the policies and processes needed to move towards the path of sustainable development. It is said that global warming will affect mountain areas quicker and faster than the plains. Poverty and resource degradation issues are already serious in the mountain areas and global warming will further accentuate this. Novel and innovative approaches that bring together communities as well as governments will be necessary to address the problems even as our understanding of the issues increases. As roads link the remote regions to the national and international markets, the very notion of subsistence farming is undergoing a fundamental change, and in many areas it is fast losing its relevance. The small

farmer in the HKH is facing multiple challenges both from within and from outside. Slow but steady increase in access, increased literacy, and a consequent search for new opportunities in a context where local opportunities remain woefully limited, is motivating droves of young men and women to move towards urban centres in search of new prospects. The pace of urban growth has hastened. Many are moving beyond national frontiers, to south-east Asia, to the Gulf and beyond. Economies such as that in Nepal have begun to rely heavily on remittances, even as the remittance receiving households move in increasing numbers from rural hamlets to market towns and urban centres. With the increased role of remittances, economies also expose themselves to increased vulnerability. New opportunities that appear as comparative advantages in the mountains – mountain tourism, biodiversity resources, hydropower development – are taken advantage of by outside interests. The challenge is to create a context where mountain communities can benefit and prosper from these developments.

The new Strategic Framework and Medium-Term Action Plan (2008-2012) of ICIMOD is organised around three strategic programmes – Integrated Water and Hazard Management, Environmental Change and Ecosystem Services, and Sustainable Livelihoods and Poverty Reduction. Three major results are expected: equitable and sustainable water management at macro-level, the provision of stable eco-system services at the meso-level, and the generation of more sustainable livelihoods at the micro-level. I hope that ICIMOD will be able to define these results in more tangible and concrete terms and deliver something substantive to the countries of the region.

For 22 of the 25 years of ICIMOD's existence, it operated from rented premises. It is, therefore, a welcome relief to see that the Centre has finally been able to house itself in permanent quarters. Lately ICIMOD has developed a 'brand image', projecting itself as an institution that is ready to take up new challenges. I take this opportunity to congratulate ICIMOD for the efforts it is making to promote itself as regional learning and knowledge centre while, at the same time, making its presence felt in the international arena. At this juncture I would also like to advise ICIMOD to develop strategies for transferring the knowledge and experience it continues to generate to the universities and centres of learning in the HKH region.

As a Member of the Board of Governors, I would like to thank ICIMOD for all the good work that it has done over the past 25 years and also assure the Centre that it will continue to receive full cooperation and support from the Government of Nepal. I believe that other regional member countries have also committed to continue and enhance their support to ICIMOD given the Centre's growing role in addressing the multiple challenges confronting the HKH region. Finally, the Himalayas reach their loftiest heights in Nepal, and the Government of Nepal is proud to host this unique institution devoted solely to the mountains and its people.

Pakistan

Message from Mr M Zia-ur-Rehman

Member, ICIMOD Board of Governors; Secretary, Ministry of Food, Agriculture and Livestock, Government of Pakistan



The long and well-established relations between the International Centre for Integrated Mountain Development (ICIMOD) and a number of research and development institutions in Pakistan show ICIMOD's commitment and dedication to the promotion of innovative research and the dissemination of knowledge in this part of the Hindu Kush-Himalayan (HKH) region. ICIMOD's

cooperation in different fields of science and technology serves as a bridge between research and its application in the field, helping to alleviate poverty and restore natural ecosystems. The sharing of good practices by ICIMOD has strengthened the research base of many institutions in Pakistan, such as the Pakistan Agricultural Research Council (PARC), Pakistan Meteorological Department, Pakistan Forest Institute, and the Centre of Excellence in Geology, Peshawar. So far, ICIMOD has collaborative programmes with some 22 institutions, including NGOs, in Pakistan. After the recent earthquake disaster in northern Pakistan, ICIMOD provided valuable support in terms of risk assessment and the rehabilitation of watersheds, in collaboration with FAO. Its support in the areas of agricultural biodiversity, apiculture, rangelands, GIS/remote sensing, and water resource monitoring and assessment, through capacity building and technology transfer is highly appreciated. ICIMOD's initiatives in resource database development and management using geo-informatics and geo-data networking have broadened the base of information technology and provided a rapid access to and transfer of discrete information among stakeholders. The inventory of glaciers and glacial lakes in the HKH region of Pakistan is an excellent example of ICIMOD's collaboration with PARC. This inventory has provided a base for the future assessment and monitoring of water resources and the mitigation of flood hazards in this part of the Himalayan region. Such information is of great importance to countries like Pakistan, where irrigation networks and power generation are heavily dependent on snow and glacier melt in summer and where flood hazards threaten livelihoods and habitats downstream. Such information also helps policymakers in their initiatives in the area of climate change and global warming.

Now it is time to focus on the aftermath of the changing climate by strengthening the regional network base provided by ICIMOD and enhancing the future research capacity towards adaptation and mitigation. It is essential to develop and integrate agriculture mitigation and adaptation frameworks for climate change into sustainable development planning at the national and regional levels to cope with the projected impacts of climate change. There is vast scope for

future collaboration with ICIMOD in areas like (i) resource assessment and the management of arid mountain regions in Pakistan (i.e., Baluchistan and Sindh), for which there is limited knowledge and experience; (ii) the monitoring of snow, ice, and water resources and associated GLOFs and flash floods; (iii) the promotion of renewable energy for better rangeland and water management; and (iv) the exchange of regional experience to help alleviate poverty in mountain areas. ICIMOD has a wealth of baseline information and regional expertise, which should be fully tapped to help the poor and restore natural ecosystems

A close-up photograph of a person wearing a white headscarf and a light blue patterned shirt. They are holding a woven basket above their head, pouring a stream of golden grains, possibly rice, which is captured in mid-air, creating a bokeh effect. The background is a clear blue sky.

3

Expectations and the Role
of ICIMOD: Reflections
on Achievements and
Lessons Learned

The International Centre for Integrated Mountain Development: From an Ignored Idea to a Global Voice

Dr Klaus Lampe, Founding Member, ICIMOD Board of Governors
Former Director General, International Rice Research Institute

From Munich to Paris: The Journey to Establish ICIMOD

The Hindu Kush-Himalayan (HKH) ranges, the largest mountain region on our globe and water reservoir for more than a billion people, still belongs to one of the most neglected and marginalised areas of the world. Political, technical, and economic developments since World War II have undoubtedly fundamentally changed the lives of most people on Earth – but is this also the case in the HKH region? Twenty-five years ago, ICIMOD, the International Centre for Integrated Mountain Development, officially opened its doors. Such special anniversaries are an opportunity to put achievements and failures, progress and setbacks, on record, and to draw conclusions and recognise new directions, objectives, and challenges. Standing at a new crossroads, ICIMOD is asking: Where do we go from here?

Long forgotten, but still relevant, are the 10 years in which many efforts were made to establish the centre that is known today as ICIMOD. An Indian manager of a multi-national food company, Aspi Moddie, and an American architect living in India, Joe A. Stein, can claim fatherhood of the idea for “A centre for mountain environment (CME)” developed in 1973. The outline written by Stein at that time contains most of the elements that are covered by the institute today.

The mountain-devoted duo soon became a quadriga of four horsemen, with the addition of John C. Cool from the Ford Foundation in New Delhi and myself, from GTZ in Germany. Together we formed this little union of like-minded individuals. Despite the distance between us and the lack of reliable means of communication, the start was promising. Only a year after the first get together in one of Delhi’s old gardens, an international workshop on the development of the mountain environment was held in Munich in 1974. For the first time, about 40 participants from 14 countries and institutions met for one single reason: giving integrated mountain development a home and a voice. A remarkable group of highly respected, capable individuals devoted to mountain development spent a whole week hammering out a concept for a mountain centre somewhere in the Himalayas. In retrospect, perhaps this meeting was the first step on the long road towards ICIMOD. Although it had its shortcomings, at least three outputs, as well as a carefully written and published document, are worth putting on record: the Munich Mountain Environment Manifest, the Statement of Concern, and the Interest Mobilisation and Fund-raising Task Force.

The Mountain Manifest

This two-page 'Munich Mountain Environment Manifest – Mountains and the human future', has not lost its relevance and is worth citing here.

- "Man has been the maker of desert in the past, even with his bare hands, and often in the name of progress. Now that he is multiplying fast, and has more powerful technology, his capacity to endanger the balance between Man and Nature ('only on Earth') has been enhanced many times.
- About a third of the Earth's land surface, the mountain regions, seemingly permanent, are among the most fragile once deforestation and soil erosion begin. Yet their potential for human wellbeing, for agriculture, forestry, water and power systems, and recreation, can affect half the human race, for better or for worse. In many places the misuse of mountain land causes economic losses far in excess of any gains from development endeavours.
- Eco-stress in the mountains has a widening destructive impact in the plains with floods; the siltation of dams, reservoirs and ports; the loss of agricultural produce, and of homesteads; leading to irreplaceable human and economic losses.
- The combined eco-stress on mountains and plains affects the world's two major problems, food and energy, especially in the developing world. Eco-stress undermines national and international efforts in economic development.
- Yet, there is hope, and there is vast potential for human benefit, given awareness of the problem; and if conservation-oriented development techniques are explored. Eco-development also needs new levers for resources and employment generation, especially in poor developing mountain lands, which are in both an ecological and a resource trap. In many areas important possibilities exist especially where recreational potential and hydrological resources exist but are not availed of.
- New sources of energy for mountain people are the key to the problem of saving and spreading forest cover, the shield of agriculture in both mountains and plains. There is promising potential for such new sources of energy from hydropower, fuel forestry, and even solar energy.
- Urbanisation and population increases are driving millions of plainsmen to seek recreation and peace in the hills. This is a mounting environmental threat, but one which can be turned into potential benefit if ecologically planned tourism, which can respect landscapes and cultures, could provide alternative employment for populations whose subsistence technology is rapidly depleting their resources of land and forest.
- We, who are concerned with the implications of ecological degradation of mountain environments, believe that the dimensions of this problem call for an immediate transnational, multi-disciplinary response including the joint use of all available scientific, technical, economic and political possibilities. The time for such a response is now, in word and in action. The hour is already late!"

Statement of concern

A very brief and concise paper based on the Mountain Manifest, the Statement of Concern was designed to be signed by the most influential leaders of the world at that time and published in the world's leading newspapers. It was meant as an alert-notice to save the mountain ecosystems and to simultaneously protect the basis of the existence of the billions depending on mountain water. However, the document never went beyond the draft stage. Funds needed to publish it could not be generated. As the expertise to implement it was missing, a good idea was put to rest.

Interest-mobilisation and fund-raising task force

The four horsemen were assigned to explore the possibility of intellectual support and funding for a mountain centre in the US. This short mission in June 1975, prepared with the best of our knowledge, became a harsh lesson learned. Despite a lot of sympathy, we failed to market the idea professionally. We were not successful in raising the funds needed to get the idea to the public and the influencers of the world. Our group was too small to shoulder such a task.

But UNESCO, already represented at the Munich Conference in 1974, finally became interested in the Centre's establishment. In 1975, UNESCO organised a conference that opened new doors for another organisational structure. The first thoughts of an intergovernmental, regional development institution for the Himalayan region were formulated. However, another nine years had to pass until the UNESCO agreement was prepared, the member countries convinced, and all the administrative hurdles overcome.

At the beginning, there was resistance within the region, as well as within the group of promoters. The thoughts of the group at that time were strongly influenced by the success stories of the first international agricultural research institutions in the 1960s. The creation of the International Rice Research Institute (IRRI) is a typical success story of private foundations in the new world. At that time, Asia was confronted with a set of challenges not so different from today: food shortages, reduced crop yields, and shrinking production efficiencies, combined with high population growth rates and sky rocketing oil prices. The public administrations of the major countries were overstrained and the private sector widely handcuffed. The Rockefeller Foundation and the Ford Foundation didn't think in terms of food aid and surplus exports, as public administrations do until today. Their aim was to mobilise the national production potential based on a long-term development programme. The Rockefeller Foundation, with its maize and wheat experience in Mexico, and the Ford Foundation's financial resources were pulled together to develop a joint programme to create an international institute for rice research. The lesson learned: the creation of a new institution needs not only a vision, but professionally sound political, organisational, and financial support that can best be mobilised through existing organisations and individuals with the respective experience, influence, and persuasive power.

The idea of an international, financially, and politically independent centre for the development of the world's largest mountain region was a dream – a dream ignoring political realities. But the dream materialised in 1983 following an agreement signed between the Government of Nepal and UNESCO in 1981 in Paris. With all due modesty, it can be said that, despite its shortcomings, detours, and delays, ICIMOD might not be what it is today without the efforts of the four in the 1970s and early 1980s.

The Context at the Time of ICIMOD's Emergence

Preventing another world war, not the needs of future generations, has dominated public opinion and the political agenda in the East and West. Long-term thinking and looking beyond generally accepted horizons were largely left to people like the 'pre-ICIMOD group', who had good intentions, but lacked political influence. They had a sound professional base, but no financial base. But they were not alone in their concern. At a global level, enormous efforts have been made over the last 40 years to develop policies, strategies, and programmes towards shaping new attitudes vis-à-vis our environment, resource use, and the equitable sharing of wealth. These efforts were supported by highly respected international leaders – also with very limited success. However, at least the most important should be remembered here.

The Limits to Growth: Published by the Club of Rome in 1972, this document served as the first wake-up call. The authors might not have used the right indicators and parameters (their time horizon has already been proven to be wrong), but they were right in principle. Their warning, that growth in many aspects is limited, has been ignored. The reserves and resources, specifically the globe's non-renewable ones, would perhaps have been used differently if the world had listened at that point in time. Today, we know that oil and food prices might lead to a new validation of many globalisation effects.

The Challenge of World Poverty: This document by Gunar Myrdal, published in 1970, could still serve as a handbook for dealing with the world's key problems today. His findings were internationally recognised with a Nobel Prize, but not with poverty eradication policies.

Speech by the World Bank President: In 1973 in Nairobi, McNamara, the World Bank President, confronted his governors with a historic speech about poverty, and specifically the rural poor. Even his strong pledge to eradicate absolute poverty by the end of the year 2000 remained unheard.

Global 2000: This 1500-page report to the US President Carter was published in 1980 and is perhaps the most comprehensive document of that time with clear perspectives for the decades to come. However, it did not have any long-term influence on the political and economic decisions of the US, or any other government.

A Program for Survival: This document was published in 1980 by the Brandt Commission. Despite the eminent, but retired, authors, the document was shelved after only a few short discussions.

Our Common Future: This 400-page document was presented by the United Nations Commission on Environment and Development under the chairmanship of Gro Brundtland at the request of the UN General Assembly in 1987. No mention of mountains or ICIMOD can be found in either the text or the index. It was not influencing “our common future” at all.

Our Global Neighborhood: Produced by the Commission on Global Governance in 1995, Our Global Neighborhood made a plea for a change in governance and values at the national and international level, a reform of the UN system, and the strengthening of the rule of law. The global problems and concepts for change carefully described in this, another 400-page document, were as neglected as all the others published before.

Millennium Development Goals: The UN Millennium Development Goal to reduce poverty by half by 2015 is the latest commitment raising expectations that will not be met. The world still seems to be unable to plan for realistic, honest goals and implementation.

Global Changes since the Establishment of ICIMOD

Global technological and political developments have taken place that have fundamentally influenced the lives of billions, although mainly outside the specific mandate area of ICIMOD and the other mountain regions of the world. Political discernment and adjustment to global changes has made this progress possible. The cold war has been replaced by negotiating tables, although the amount of funds invested in defence versus development hasn't changed. According to the latest publication of the Peace Research Institute in Stockholm, 1339 billion US dollars was spent globally for military purposes in 2007, compared to 15 billion for international agricultural research, and only 8 million for ICIMOD.

Since the establishment of the Centre, a revolution in technological innovations has taken place. This has changed most aspects of our lives. The Internet, a powerful source of information, has in the true sense interconnected continents and people. New transport systems have opened the door for a global exchange of goods, services, and labour, with all of its consequences. Some hundreds of millions – especially in Asia – are profiting from the growing job opportunities, leading to living standards previously unimagined.

Information technology has probably had the largest influence on people, even those living in remote mountain regions. A village television, far away from the urban world, not only influences community life, it transmits how life, living standards, habits, and customs are defined elsewhere. This ‘dream world’ has affected hopes and expectations in a very short time, especially those of the

young, dynamic part of village communities. The results are obvious: curiosity, discontent, resistance, resignation, and finally migration, which too often ends in unemployment and urban misery.

With environmental consciousness growing and population increases slowing down, the chance that we will be able to produce enough food – following generally responsible principles – for the expected 10 billion people 50 years from now has become brighter. But not without drastic adjustments: the necessary changes will take place and policies will be implemented due to a new understanding of the value of natural resources and the growing needs of urban dwellers. The perhaps unreal, but at any rate strongly anticipated, human influence on climate change today has put sustainability on the agenda of almost every political party and government, promoting ICIMOD's mission not just within the Hindu Kush-Himalayan region (HKH).

Emerging Challenges and ICIMOD's Growing Role

Over the years, ICIMOD has developed into a vital institution with a mission fascinating as ever. Its new strategy covers the major aspects influencing the future of the region. And, most importantly, there are dedicated staff and modern facilities to implement the plan. The Centre has published its findings widely and organised numerous conferences, workshops, and seminars. It has trained countless colleagues from within and outside the region. Moreover, it has become an internationally recognised, professional institution, solid enough to overcome financial and other periods of drought. The recent review has strengthened the base of confidence within ICIMOD's constituency through its clarity. With growing concerns about food security and self-sufficiency, and increased understanding of sustainability, biodiversity, and stable yield increases, the urgent need to safeguard our natural resource base has become commonly acknowledged. Compared to 30 years ago, the Centre today can expect another level of understanding and interest in its outputs and potential impact. At least five global concerns will justify ICIMOD's existence and growing importance in the future: water, food, energy, security, and carbon dioxide.

Water

With the global population growing to about 10 billion, water supply has to be seen as the most crucial growth limiting and survival factor in future. Still wasted in many parts of the world, water shortages in other parts have become a front-page newspaper item. Humans have lived for hundreds of generations without mineral oil – but never without water. Even today, too much or too little of this powerful resource directly affects the lives of hundreds of millions of people. Accurate figures do not exist, but it is estimated that about 20% of the world's population is suffering from water shortages. By 2030, this figure is expected to increase to 30%, influencing the health and life expectancy of about 2 billion people. By the middle of the century, water requirements for agriculture will presumably double – even if research is able to increase water use efficiency. Some 70% of the freshwater available today is already used by this sector, only 20% is left for industrial

purposes, and 10% for direct human consumption. Urban population pressure, especially in Asia, but also in Africa and Latin America, will force growing investment in the whole water supply chain. Where else should we start if not in the catchment areas of the mountain river systems? ICIMOD doesn't have to motivate urbanised lowlanders to think about mountain development. Their interest starts at their own water tap and their interest in keeping it functional. The scarcity and growing price of this valuable basic commodity have already led to hostile conflict in pre-historic times and will serve as ICIMOD's strongest promoter.

Food

For the first time, the G8 Summit in 2008 in Japan dealt with food-shortages, food-prices, and hunger, not for humanitarian reasons, but in view of potential worldwide unrest. It is expected that the discussions and decisions that will be taken will go beyond emergency and makeshift solutions. Stagnant yield increases, the absence of conducive, comprehensive rural policies, the price of agricultural inputs, land tenure, population growth, and urban demand are influencing the price of staple food. We should remember that in the early seventies food prices increased even faster than today. But, even under those circumstances, the call for a water-saving, erosion limiting, hazard preventing institution remained unheard.

Land resources that can be used for food production are limited. The competition, food versus fuel, has just started. Some countries already have plans to purchase farmland overseas to ensure that the domestic demand will be met. Saudi wheat farms in Russia and the Ukraine? Saudi sheep and beef production in Australia and Latin America? These are no longer dreams. Plans are already on the drawing board for very vital domestic policy reasons. Countries far away from mountain regions have a vital interest in the protection of water resources in future. An important key to the protection of such resources is – mountain development.

Energy

Present oil and gas prices have accelerated the search for alternative resources. Water power will remain the clean, renewable, safe, and environmentally-friendly first choice wherever feasible. Even in oil-rich Norway, 99% of electricity consumed is based on hydropower, in Brazil, hydropower consumption has already reached 83%, and in Switzerland 55% of the electricity used is water-based.

Since the 1970s, the world's energy consumption has more than doubled, and it is expected to double again over the next 20 years. Given the pace of industrialisation in China, India, Russia, and Brazil, to mention only the major growth poles of today, the landlocked mountain countries with their mostly untapped hydropower resources could be major energy exporters in the future.

Security

For centuries, mountain regions have been seen as remote, insecure, and underdeveloped. The fundamental reasons are rooted predominantly in unemployment, underdevelopment, poverty, and the absence of a development policy that balances the interests of the different fractions of society. The cost in lives, natural resources, and investment in military for wars fought in these regions will never be known. If instead these funds were invested in an integrated policy that provides perspectives for all those living in and from the environment, the HKH region would look different today. In the region's capital cities, such views might be seen as naive dreams. For those who live, suffer, and survive in the region, the desire for a new form of conflict resolution is growing.

ICIMOD is not a peacekeeping, war-preventing institute. However, it could become the most knowledgeable centre on the causes of conflict – not only related to water – within the region. ICIMOD is in a position to help to define a more realistic strategy for development and, ultimately, peace.

Carbon dioxide

For a long time, the forests of the greater Himalayan region have been seen as one of the main resources waiting to be exploited. With all due respect to the authors of all the warning documents referred to already, it must be stated that, today, the world seems to understand that without retaining a protective vegetation cover our globe will not only become a dry, but an oxygen free, planet. The mountain regions of the world, and specifically in Asia, may soon be seen as an attractive place for the private sector in their search for carbon sinks. Planting trees will no longer be the concern of village movements or environmentally concerned non-government organisations (NGOs), but will become a profitable investment. Once the international agreements on carbon dioxide control are in force, sinks will be in high demand. Catchment area reforestation and its sound management will then serve at least five purposes: water storage, erosion control, carbon sink, oxygen resource, and biomass provider.

ICIMOD Beyond its 25th Anniversary: A Set of Dreams

The mountain world will not be protected because of its beauty alone, nor because of its uniqueness or ethnic and biological diversity, but for political, economic, and social reasons. Its future will be dictated by the interests of the billions living in the plains and urban agglomerations. With the growing demand for water, food, energy, security, and environmental protection, ICIMOD may become a Centre of prime political interest. For this to happen, ICIMOD will need an additional set of tools.

Using the power of the media

All major topics on ICIMOD's agenda have received global attention, but not the centre itself! There is an urgent need for a professionally sound media support service related to ICIMOD's broader mandate and client group. Seminars and workshops are needed, not only for mountain specialists, but for decision makers and those who advise and assist decision makers. Political journalists, TV moderators, and press officers of transnational companies should become a new target group for ICIMOD. A list of the 500 most important persons who can act as 'multipliers' should be made, these people should be seen as the Centre's unofficial ambassadors and treated accordingly.

The objective: To develop an increased, professionally sound, fact-based understanding by all multipliers in the public and private sectors in relation to urban industrial interests in protecting the resource base for the majority of the world's population, as well as the mountain regions – and the role of ICIMOD in achieving this.

Expanding ICIMOD's horizons

No doubt, in the decades to come, the Centre will concentrate its efforts on its present mandate region. However, there are good reasons for becoming a global advocate, an information and clearing house for mountain issues and related concerns worldwide. With its existing knowledge base and a new Information Centre, ICIMOD could be transformed into a premier resource at a global level for all aspects of mountain research and development and the interrelationship with the urban lowlands.

The objective: To become a global source of professionally assembled and assessed information on all aspects of rural-urban and upland-lowland interrelationships, including conducting related research and development activities. As a result, national and international mountain concerns will receive the attention and support that they deserve.

Creating a council of patrons

Regretting the ignorance of the public on the need for proper mountain development policies does not help. A strong political voice is needed. A council of patrons should become the protector of the world's most important natural resource: mountains. Such patrons could be active, prime government leaders or CEOs of multi-national or national companies, from within and outside the HKH region.

The objective: The council of patrons, as an independent body, will ensure that the mountain ecosystems of the world, as one of the most important life determining ecosystems, will receive and retain the attention, protection, and support that they deserve from the public and private sectors, as well as from the general public.

A new level of responsibility

Until recently, environmental aspects have dominated the research and development agenda of mountain regions. This will change in the future. Roads and transport, water and power, industry and trade, food, and fuel will influence policies related to mountain development. Sink potential for the trading of international carbon unit certificates may soon enter the international energy market. ICIMOD may soon be asked how much carbon certain regions in the HKH can absorb, through which systems of reforestation, with which species, in the shortest possible time. Since industrialisation, energy and environmental concerns have reached the present level of interdependency, the Board's country representatives should report, not to one sector ministry, but through the prime minister's office to all government institutions concerned. Such a change would automatically enhance ICIMOD's chances of promoting what its name promises: integration.

The objective: With worldwide attention on resource use and sustainability, the need to involve all relevant sectors of the government has become obvious. With country representatives on ICIMOD's Board linked to the respective regional member country's prime minister's office, multi-sector co-operation will be enhanced.

Formulating a new vision for ICIMOD

The political and economic influence of Asia has grown tremendously over the last two decades. The market force of China has already changed the world in many ways, and so will India. This dynamism and Asia's growing political and industrial strength will inspire ICIMOD to write a new vision for Asia's roof, the Himalayas, which needs major repair and protection. This may finally lead to an ambitious, broader research and development agenda, justifying the basis for an annual US\$ 30 million budget.

The objective: The need for global change within the next 20 years is fundamental. The Centre has adjusted to these new demands with a vision closely interconnecting urban and rural, and lowland and upland interests. Providing the base for dynamic growth, ICIMOD is playing its role in shaping a new future for the mountains of, and beyond, the continent.

Accessing new resources

Today, ICIMOD's annual budget doesn't even reach US\$ 10 million. Three times this amount was paid recently by the software developer Charles Simoney for a flight to the international space station. There are hundreds of other examples of imbalances in funding and priority setting. An accelerated effort is needed to safeguard the above-mentioned resources. ICIMOD's research and development agenda has to adjust to these new goals and objectives. Just to implement a critical mass of pilot resource saving schemes, a much larger investment is needed. ICIMOD's budget should come close to the proposed US\$ 30 million within the next 5 years. This will also ensure the

financing of projects by member country institutions with a proven quality record, planned following ICMOD's strategies and principles. ICIMOD can then concentrate its efforts on project selection, financing, monitoring and evaluation.

Where will these resources come from? Three of ICIMOD's regional member countries are part of the international nuclear power club. If the Centre has been successful in reaching, briefing, and convincing the respective heads of state, it should be possible to increase the regional member country contributions to a total of about US\$ 10 million per year. New for ICIMOD will be an effort to mobilise private sector funding. According to the latest publication in Focus Magazine, four Indian citizens are among the ten richest individuals in the world. Why not approach the other Asian billionaires on the Forbes list?

Conclusion

On birthdays, dreaming about the future is permitted, moving towards a new plateau of challenges to be taken up in the future. In view of the magnitude of the HKH mountain system and the problems to resolve, the Centre cannot be too ambitious or demanding. The time has come to open the doors to new ideas for actions in the second quarter century of ICIMOD's life – bringing the size of its role and its activities into harmony with the magnitude of the need for change. The time is now!

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Strategic Changes in the 21st Century: Remodelling ICIMOD for the Hindu Kush- Himalayan Region

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ICIMOD was established in 1983 with the dual mandate to conserve Himalayan ecosystems and improve the lives of the people of the Hindu Kush-Himalayan region. After 25 years, ICIMOD needs to consider the strategic issues of the 21st Century and remodel itself accordingly. All institutions have to change with the times to be relevant. Scientists and professionals also have to change with changing perspectives and sometime have to move beyond their disciplines. Perspectives and realities have changed significantly since ICIMOD was conceived and established in 1983.

ICIMOD now needs to ask itself the following:

- What are the strategic changes in the Himalayan and trans-Himalayan environment – political, social, economic, cultural, and scientific – since ICIMOD was founded in 1983, and what global changes have there been that influence the region?
- What changes are necessary to remodel ICIMOD's perspectives and revise its programmes?
- What are the lessons learned during the past 25 years? To answer this, calls for hard self-analysis, especially in relation to ICIMOD's impact on the eco-development policies of the Hindu Kush-Himalayan region at the government, district, and grassroots levels.

This paper will be primarily concerned with the first question, and will reflect on the second. I will leave the third question largely to ICIMOD.

Let me first briefly list the major strategic changes taking place and for the future to indicate their sweep and depth at the start.

Global and Regional Changes

Climate change: Climate change and the resultant impacts will be the biggest and most threatening global and regional change factor during the next 25 years. Climate change is not widely understood by people other than climate scientists, not even by governments.

Political changes: Political relations in the region, and in Asia generally, are also changing and will form the framework for future peace, prosperity, and international co-operation in a fast-changing world. Politics is of primary concern, even for professional and scientific people. ICIMOD must take this into account if it is to work in the real world. Only good governments can enable ICIMOD to deliver its services to the people of the Himalayas.

Cultural changes: Cultural changes in the traditional 'Abode of the Gods' play a role in all political, social, and economic changes.

Demographic changes: Demographic changes in the region have significant political, social, and economic consequences, as well as consequences on the depleting of ecosystems in mountain regions.

Decentralisation of government: There is a need to redress the centralisation of governance in the HKH region and to strengthen again the traditional capacities of local communities to manage natural resources and support eco-development. This is a challenge for countries and local communities in the region, in a time of changing political regimes. New Asian regimes tend to depend too much on central governments. The concurrent promotion of successful NGOs and self-help groups is vitally important as a bridge: a basic imperative for the success of all eco-development work and for ICIMOD. Has this been given sufficient importance in past ICIMOD policies and work?

Alternative energy science and technology: The development of science and technologies for the post-carbon age is very relevant in the context of climate change and impossibly high oil prices in one of the most vulnerable and remote regions of the world-far from oil, gas, and ports. This will be important for both economic development and quality of life in the region.

Tourism: Increases in global tourism will have environmental, economic, and cultural impacts on the traditional 'roof of the world' region, with its vulnerable ecological conditions. The region is no longer the pre-1950s 'Shangri-la' known to just a few explorers. Tourism can play a vital role, with both positive and negative impacts, in the development of the region, from hill stations to the South Col of Everest, and not least in the growing towns and cities like Kabul, Srinagar, Darjeeling, Kathmandu, Lhasa, Gangtok, and Punaka.

Implications of Global and Regional Changes for ICIMOD

Let me elaborate a little on each of these before coming to the changes required of ICIMOD and its self-analysis of lessons learned in the last 25 years.

Regional implications of climate change

Firstly, what are the indications of monsoon changes in and around the Himalayan region? There are already indications of less rain, changes in past annual weather patterns, a serious drying up

of hill springs, changes in horticultural zones, and, most publicised of all, receding glaciers. To what extent does ICIMOD have hard scientific data for the region, and what are the gaps, where are more and better scientific data needed?

A vast mountain system like the Himalayas has many sub-regions of climate, both in latitude and altitude. How much hard reliable data do we have about regional microclimates? How much evidence of microclimatic changes and their consequences comes from the first hand experience of local communities?

Whatever the global and macro data, in a multi-climate region like the HKH both local data and local responses are very important. What are the estimates of future water supplies in the sub-regions and of the consequences of different degrees of glacier retreat and changes in rainfall on downstream water resources? Are there reliable projections of all of these for the next 25 years? What of the future of Asia's major rivers, all rising in the wider HKH region, and all shared by many people and states? This is a major geo-political question for the present and the future.

Apart from climate change and future rainfall and water availability, what will be the impact on hill farming systems, dams, hill springs, and biomass? Contrary to apprehensions about extensive deforestation 25 years ago, both the Himalayan foothills and the Western Ghats have experienced as yet unresearched, but observable, increases in the natural regeneration of plants. This is probably the result of an increase in the supply of cooking gas and an increase in local incomes from the growth of industrial and service sectors in the early stage of development. How can this process of natural regeneration of biomass be promoted through the use of alternative energy from gas, solar, wind, and hydro sources?

What impact will carbon trading have in the region? Is it a realistic prospect, especially after the failure of Kyoto and the new Lieberman-Warner targets in the US designed to cut carbon levels to 70 per cent below 2005 levels by 2050, as well as the progress in reduction in the European Community? An International Monetary Fund study (April 2008) shows that smart carbon policies could contain climate change without harming the global economy. The political/business climate for the reduction of greenhouse gases is changing, even in America. Could India and China modify their post Kyoto positions in the future? The climate of informed opinion is also changing and no longer regards the environment and the economy as antithetical. Evidence is building of economies benefiting from environmental progress. Amory Lovins of the Rocky Mountain Institute says annual industry investments of \$120 billion per year in improvements like green building and more efficient cars could yield an additional \$900 billion per year in savings by 2020. This level of investment could reduce carbon emissions by 50 per cent keeping warming at no more than 2°C hotter than at present. Germany, the 'greenest' country in Europe, has much green technology to offer.

Can ICIMOD develop a new scientific vision and create a specialist division to bring environmental science and technology results to the HKH region that have already been developed by the corporate sector, and under state policies like that of California?

Such technologies are being developed by many companies in many different countries, for example the following:

- Acciosa, a growing Spanish company, is working on wind, bio-fuels, hydro, and solar thermal energy.
- The Sanyo eneloop rechargeable battery and solar charger provides a 'clean energy loop', opening the way for a path-breaking line-up of energy efficient products.
- Amyris Biotechnologies in the San Francisco Bay Area has developed ways to genetically modify bacteria to make better bio-fuels, side-stepping the food-energy debate.
- Suzlon has pioneered wind energy in India to become the world's sixth largest producer.
- The Honda IMA hybrid system (green car) with its clean diesel engine and intelligent gasoline engine and electric motor powered by combining hydrogen and oxygen in the ultimate power plant, could greatly help the transport sector in the HKH region, where transport costs are high.

Venture capital is opening up to clean, viable, alternative energy. The American Energy Society estimates that the number of green jobs in the US could rise to 40 million by 2030, and they are rising elsewhere too. These are only a few of the many prospects. Can ICIMOD open this new promising window in the HKH region in cooperation with the region's governments and global corporations? Can it move into the post-carbon age by 2030, as Iceland is moving into the hydrogen energy age? This could be a major new and practical thrust area for ICIMOD in the next 25 years.

Soft-power to soften hard politics

The second major issue is 21st Century politics in the HKH region and Asia. ICIMOD may be a non-political body, but it can help all its regional member countries and people by offering cooperation in 'soft-power' options, for example making clean new technologies and other technologies to address climate change more viable – an inevitable need with high oil prices; enhancing employment, incomes, energy, and infrastructure; facilitating the infusion of more capital for these new technologies; promoting prospects for more trade within and beyond the region; and promoting cultural programmes within the HKH region for closer people-to-people relations.

Soft-power promotes prosperity, peace, and harmony

The new model of Bhutan and its concept of gross national happiness is an interesting study for ICIMOD. The HKH region is rich in traditional art and culture, which should not be swept away by

mindless unimaginative change and is as important as GNP, besides being a magnet for tourists. This is a challenging new area for ICIMOD, to be true to Himalayan tradition and the historical example of the prosperous Silk Routes, which were culture routes for progress as well as routes for cross-border trade and cooperation.

Impact of demographic changes

Demography is determined not only by the rise and fall of indigenous populations, but also by state-created and voluntary migration. Behind the forces of politics, economics, and technology, the world is becoming more aware of demographic impacts on the fate of nations. For example, the rise of China and India is underlined by an enormous growth in youth populations with new aspirations. Europe and Japan are apprehensive about the growth of their aging populations and declining numbers of youth, and the associated economic costs.

The HKH region has seen a tripling in its population in the last two generations, far beyond the ecological carrying capacity of the region. This has led to the migration of surplus poor to other Himalayan regions which has associated political and economic implications, and significant implications for ICIMOD's concern for 'mountains and peoples'. There are both political and non-political implications, which may not have concerned ICIMOD sufficiently in the past, but inevitably have a significant impact on its eco-development objectives. Can ICIMOD afford to ignore these impacts in the future? It may be unscientific to do so in one of the world's most ecologically deficit regions. Governments in the HKH region are not fully aware of the long-term impacts of changes in demographics, or of the inevitable rise of ecological deficits in Himalayan ecosystems, despite the rising expenditures on development in the region. This lack of awareness is reflected in the development policies of the last 50 years. Government expenditure, except where it was focussed on specific ecosystems, has not reduced past ecological deficits per capita in relation to biomass, water, and energy. Eco-deficits detract from true GNP, per capita wealth, and Human Development Index (HDI) criteria. Hence the importance of the decentralisation of natural resource management and the revival of local village/sub-catchment systems of management of natural resources with NGOs and self-help groups (see below).

Tourism: Cost or Benefit?

One of the modern world's great surges is the enormous rise in global tourism, which the HKH shares but with underdeveloped infrastructure and depleting ecosystems. The surge in the next 25 years is likely to be of Himalayan proportions in the wider HKH region, and to have significant consequences and economic benefits for the region. How far has ICIMOD made comparative studies of past tourism impacts in, say, Kashmir, Garwal, Nepal, Bhutan, and Tibet? What new policies are needed for eco-tourism and environmental management before the great surge of the future drowns, destroys, and diminishes the economic benefit to local economies and their ecosystems? What steps need to be taken to protect the most vulnerable areas, e.g., the Gangotri,

Nanda Devi, and Everest regions, and to protect urban tourist centres such as the Indian hill stations, Kathmandu, Gangtok, Lhasa, and Punaka from adverse impacts? How far can local people be stakeholders in, and co-beneficiaries of, tourism? The lessons learned in Ladakh and the Annapurna region may be helpful in providing a model of European 'pension' or 'bed and breakfast' style tourism, in which local families play host and benefit. Lastly, there is also the problem of mounting tourism waste disposal, from the capital cities to the mountain camps.

Non-government organisations/self-help organisations

The governments of the HKH region have limitations in terms of their capacity for eco-development. Past history has shown that centralised governments in colonial and post-colonial times have destroyed Asia's valuable traditional village system of managing local resources such as water and biomass, and even providing social security. This damaging process needs to be reversed. How can ICIMOD help promote a) the growth of good local village institutions, and b) the growth of NGOs and indigenous self-help organisations as a major instrument in mountain region eco-development? Even though in Asia the divine right of kings is being replaced with the right of political parties, let us not forget that Asian civilisations have their roots in non-government cultures. Centralised governments in the HKH region have produced failing states, unable to either centralise or decentralise effectively. Countries need to learn from the history of their own societies. Divine rule is vanishing (the latest in Nepal), and people's aspirations are rising. The political and economic fate of the modern world lies in the crucial new linkage between political parties and local people in all forms of government. The HKH region is facing this challenge in all its eight countries. How then can bridges be built constructively towards peaceful eco-development with the help of non-political NGOs and self-help organisations? How can ICIMOD make this a helpful new component of grassroots organisational delivery systems between state bureaucracies and the people?

Conclusions

So, if in its 25th year ICIMOD is considering 'ICIMOD and the Himalayan Region: Responding to Emerging Challenges', it needs to address three fundamentals.

Firstly, ICIMOD needs to conduct a self-analysis of how it has performed over the past 25 years, taking into account the context, circumstances, mindset, and challenges during that time. Have there been good internal and external evaluations? Should new ones be commissioned from independent professionals or qualified organisations? Secondly, the emerging regional and global challenges should be clearly identified (some of which have been indicated briefly in this paper). Thirdly, as a result of the first two, in what ways is it necessary to remodel ICIMOD's objectives, the organisation, and its activities in the future? To succeed, organisational innovation has to match innovative policies and plans.

Addressing these will require a meeting of many good innovative minds from many worlds, including government representatives, professionals, scientists, consultants, and representatives from NGOs and self-help organisations. Most of all, at the end of the day, a lot will depend on the leadership quality of ICIMOD itself. ICIMOD was set up as an international body with leaders from the government, academic, and development worlds. Does it need to imbibe the more pragmatic corporate culture of innovation, response to change, and results orientation, with annual operating plans and periodic internal and external evaluations; does the present methodology fulfil this?

These are the thoughtful offerings of one of ICIMOD's aging founding fathers, who recorded his early impressions of the decade of formation (1973–1983) in *"Voices in the Wind"*. Times have changed, and will continue to change. New voices are being carried in the winds of the next 25 years. I hope that ICIMOD also listens to these voices.



The Evolution of ICIMOD: From Concepts to Good Practices

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Introduction

Twenty-five years ago, guided by concern for the widespread destruction of forests and natural resources, and the resultant burgeoning environmental and economic problems in the Himalayas, the international community and the eight countries of the Hindu Kush-Himalayan (HKH) region conceptualised and established ICIMOD as the first international centre to focus on the complex and multiple problems facing the mountain areas in the HKH region. The founding fathers of the Centre clearly stated ICIMOD's mandate as being to provide scientific and technical advice and backstopping to the regional member countries on contemporary issues concerning integrated mountain development by acting as an interface between research and development, often playing the role of an honest broker of knowledge and information.

ICIMOD's mandate (to contribute to sustainable and integrated mountain development in the HKH) presented a huge challenge to the Centre from the very beginning and has shaped its evolution over the last 25 years. The major challenges remain those related to ICIMOD's strategic goals and objectives, namely a) the promotion of an 'integrated and sustainable mountain development' agenda, and b) covering the vast and complex geographical landscape and diverse array of people in the HKH region. This paper recounts how ICIMOD has addressed the region's issues, faced challenges, and used opportunities in a way that has led to the successful evolution of the concept born in an international workshop in Munich in 1974, leading to the establishment of ICIMOD in 1983, and to today's ICIMOD spreading the message of pro-poor policies and good practices throughout the region and reaching out to the global mountain community. ICIMOD today is a vibrant centre of information, knowledge, and learning; although numerous challenges remain.

The First Challenge: Thematic Breadth

From its inception, ICIMOD's role has been broadly spelled out as a) a multidisciplinary information and documentation centre on mountain development, b) an agency for coordinating, supporting, and conducting participatory action research, and c) a centre for providing specialised training and technical backstopping on 'integrated mountain development' (or IMD). It is perhaps due to the

awareness generated by the process of establishment of ICIMOD, which took almost 10 years, that ‘integrated mountain development (IMD)’, both as a slogan and as an indicative approach, has become a popular and attractive term in both policy-planning groups and donor circles, thus greatly increasing stakeholders’ expectations and hopes for the Centre. However, the operational aspects of ICIMOD’s rather ambitious mission, and the objectives, which were no less daunting, remained undefined. As expected, ICIMOD faced many financial, technical, institutional, and policy constraints and hurdles to putting its roots firmly in the ground and growing. To look more deeply into this predicament, the term ‘integrated mountain development’ has been widely used to mean different things by different people. One dominant view was that IMD programmes were designed sectorally, but implemented multi-sectorally through the involvement of compartmentalised departments. In contrast, the concept put forward by ICIMOD meant that programmes were designed in a multi-sectoral or multidisciplinary manner and implemented sectorally or by concerned agencies in a coordinated way based on prior agreement as to common processes and outcomes. Therefore, the challenge, as well as the reality, was how to articulate and adapt IMD to suit the complex and diverse policy, institutional, and implementation environments of the different member countries in the HKH region (Boxes 1 and 2).

In the absence of conceptual clarity and a lack of clear operational guidelines, ICIMOD had to search for its own understanding of the ‘what’, ‘how’, and ‘where’ of ‘integrated mountain development’ in a practical context, in order to define the scope of, and guide, its work. The

BOX 1: Integrated mountain development and ICIMOD

In response to an informal question, during a conference dinner in 1987, on the “what and how of integrated mountain development and the way ICIMOD should approach it?”, one European participant (reflecting the dream of the 1974 Munich Workshop), responded as follows: “With the help of ICIMOD, the Himalayas should replicate the history of regeneration of the Alps”. I am sure the participant was aware of the vast differences in terms of geology, history, demography, and socioeconomic status between the Alps and the Himalayas. The Himalayas – the youngest, highest, and most fragile mountain system – is beset by problems such as high population pressure and poor access to education, roads, electricity, food, and medicine, that create a heavy dependence on forests and other bio resources for food, shelter, and energy. In addition, the existing highly exploitative and unequal highland-lowland links, which evolved through historically feudal and colonial rule, have contributed to the severe depletion of natural resources and led to a vicious cycle of poverty, environmental degradation, and deprivation.

existing formal knowledge, information, and data on hill and mountain development were largely driven by individual disciplines and sectorally focused, and the policymakers did not really know how to handle the puzzle of 'integrated mountain development'. The major challenge was that the idea of 'mountain' as a context was rarely understood or even perceived. The somewhat poetic statement in Box 2 broadly conveys the essence of our argument.

In an attempt to start its long and arduous journey towards IMD, ICIMOD extensively reviewed expert writings, reinterpreted the recommendations of several workshops and seminars, and analysed the available information to define the components of 'integrated mountain development', which it hoped would eventually lead to sustainable mountain development (SMD). The process was comprised of knowledge gathering, especially literature review, critical assessment, and the targeted dissemination of synthesised knowledge through a series of policy discourses and participatory colloquia to the practitioners and policymakers of ICIMOD's member and sponsor countries.

An important dimension of the above tasks included ICIMOD's efforts to create its own professional (technical) capacity and build a team of 'mountain development experts'. Accordingly, it engaged relatively senior professionals from the regional member countries (RMCs), invariably having specialised in a particular sector in their past work as multi-sectoral experts were not yet trained and available. The challenge for ICIMOD was how to use sectoral expertise to create multi-sectoral human resources to focus their work on integrated mountain development options and methods. ICIMOD introduced team thinking and group work, which made it somewhat easier to develop regional collaborative programmes.

ICIMOD also faced the challenge of how to go through the available holistic development related literature and distil from it the parts relevant to planning and designing development packages to improve the livelihoods of highly vulnerable communities in the mountain and hill terrain of the

BOX 2: To understand the greatness of mountains

"To see the greatness of a mountain, one must keep one's distance; to understand its form, one must move around it; to experience its moods, one must see it at sunrise and sunset, at noon and at midnight, in sun and in rain, in snow and in storm, in summer and in winter, and in all other seasons."

One might complete this poem by adding "to understand the mountains better, one must examine them with and without people and their age old culture and agricultural practices".

Mountains grow and decay, they breathe and pulsate with life. They create wind, clouds, thunderstorms, rain, waterfalls, and rivers.

Lama Anarika Govinda
The Way of the White Clouds

Hindu Kush-Himalayan region (HKH). ICIMOD had to combine the romantic perceptions held by the plains dwellers about the serene ‘Himalayas’ with the stark reality faced by the mountain inhabitants daily struggle with problems such as poverty, hunger, overpopulation, rapidly depleting natural resources, and the poor reach of government projects and programmes.

The Second Challenge: ICIMOD’s Large Geographical Mandate

The vast geographical coverage of the HKH, spanning 3500 kilometres from east to west, and dissected by eight political boundaries, with less than healthy political relationships between some of them, posed a major challenge to ICIMOD in promoting regional cooperation. Although the eight member countries did share common mountain specific problems, such as high poverty, illiteracy, environmental degradation, and underdevelopment, many of them had serious differences in their perspectives and approaches to addressing these problems. Their political differences, which are deeply rooted in the tumultuous history and geography of the region, constrained the

cooperative planning and implementation of ICIMOD’s programmes in the region in a variety of ways for some years.

BOX 3: Conserving Himalayan mountains: harmonising people and nature

The Himalayan mountains present two contrasting realities – ‘beauty’ and ‘poverty’ – but at the same time they offer an opportunity to use the unique natural landscapes and products to alleviate poverty and thus resolve the dichotomy and bring about some form of harmony. Himachal Pradesh (HP) in India and Yunnan province in China are moving towards such a balance, thanks to the huge expansion of tourism, outsider investment, and efficient governance systems. The local governments in these areas have developed mountain focused economic development plans reflecting their own priorities and building competitiveness based on their comparative advantages. They have also created good infrastructure, established mountain focused education and research institutions, and are promoting sustainable mountain development.

In contrast to the high interest and expectations of ICIMOD’s sponsors, the RMC governments, especially the larger ones, took time to set their priorities for their policies on mountains. ICIMOD promoted and championed the cause of the HKH using comparative advantages like the dependence of important industries in these countries, for example the pharmaceutical industry, on the niche natural resources sourced from the mountains; and the high value attached to the ‘Himalaya’ as the ‘abode of gods’, a pristine tourist destination, and a strategic landscape. ICIMOD’s position as an intergovernmental agency with a neutral agenda and a non-political status was an added advantage. The mountain people, their institutions, and their representatives from all the member countries needed massive awareness building and involvement, and this happened to be the basis of many of ICIMOD’s initiatives, making them receptive to ICIMOD sponsored activities. ICIMOD’s people-centred participatory approach to development was

attractive to local institutions, especially NGOs. Therefore, despite initial difficulties operating as a regional organisation, ICIMOD was able to rally and sustain the support of the RMC policymakers to stand together on a common platform to address the problems of mountain areas in each of the RMCs. During its first decade, ICIMOD staff started to gain a better understanding of the administrative procedures, ethos, and practices, as well as decision makers' perceptions, in the RMCs, and started getting them to listen to their views, approaches, proposals, and collaborative ideas. The decision makers slowly started to appreciate that the genuine gathering and sharing of information and knowledge could help them to address problems in their work on mountain development. Regular interactions and joint meetings involving scientific and technical personnel from different RMCs were used to open the way for dialogue with senior policymakers across the geo-political divide (see Boxes 3 and 4).

Constant Reflection and Reappraisal

ICIMOD staff, during the second decade of its existence, started gaining a better understanding of the mountain specificities and imperatives through systematic field assessments, constant dialogue with national partners, and collective reflection. They started coming up with new ideas and packages of practices to promote IMD. The Mountain Farming Systems (MFS) division of ICIMOD, set up in the mid 90s, took the lead in changing the conventional focus on mainstream or lowland agriculture, and started to work on diversified and market-oriented agricultural systems, based on the premise that mountains possessed specific constraints and opportunities and, therefore, needed a different approach in terms of diagnosis and designing plans and programmes. Based on an in-depth analysis of the mountain situation and its distinguishing features, mountain agriculture was redefined in terms of five mountain specificities: inaccessibility, fragility, marginality, diversity, niche opportunities, and human adaptation mechanisms. This farming system based concept quickly broadened its scope and started evolving into what has become widely known as the Mountain Perspective Framework or MPF.

BOX 4: Reflections of the First Deputy Director of ICIMOD

"I spent seven years at ICIMOD, during which time I learned a lot. My stay at ICIMOD gave me tremendous experiences and knowledge about the problems of the Hindu Kush-Himalayas. At that time, Myanmar and Afghanistan had not formally joined the ICIMOD Board. During my tenure 'water' was a very sensitive word and programmes on rivers and their water level or rainfall data were very difficult to get off the ground. Now I see a tremendous change. Currently, one of ICIMOD's three main programmes is on water resources."

Dr Ram Prakash Yadav

Development of the Mountain Perspective Framework: A Major Milestone

Due to the enthusiastic response of a large number of readers, the 'Mountain Perspective Framework' (MPF) quickly extended far beyond the boundaries of mountain farming systems and was applied to the study and understanding of natural resource management as well as sustainable mountain development policies and programmes in the HKH region. The MPF was developed through a process of extensive review and re-interpretation of the available literature and through field studies in China, India, Nepal, and Pakistan in partnership with and with the contribution of national institutions, becoming a new mantra for mountain development worldwide.

As a conceptual and operational framework, MPF defines the uniqueness of mountain situations as a basis for designing and implementing integrated mountain development solutions for sustainable livelihoods and the environment. Put in simple terms, MPF recognises and takes in to consideration the unique conditions of mountain landscapes – mountain specificities – that broadly differentiate the mountains from the plains.

As an initial validation of MPF as a conceptual and operational framework, ICIMOD compared successful and unsuccessful development initiatives, linking them to their implicit or explicit adherence or non-adherence to the imperatives of mountain specificities. In this way, the Centre managed to establish the validity and utility of an integrated approach to sustainable mountain development. This sort of cutting-edge approach also helped in understanding and articulating the issues of sustainability/unsustainability of mountain agriculture and natural resource sectors in international forums.

BOX 5: What is the Mountain Perspective Framework?

In simple terms, the Mountain Perspective Framework, or MPF, implies definition, recognition, understanding, and adoption of the landscape specific status and imperatives of mountain conditions (mountain specificities), such as a high degree of inaccessibility, fragility, marginality, diversity, niche opportunities, and human adaptations, and takes these into account when designing and implementing interventions in hill and mountain areas. Most of these mountain features are interlinked and have both biophysical and socioeconomic (including cultural and political) dimensions, and thus call for an integrated and multi-stakeholder approach.

The MPF also helped ICIMOD to participate in global discourse and initiatives such as arguing for the Mountain Agenda during the Rio Conference, the Millennium Ecosystem Assessment, the International Year of Mountains (IYM), and Mountain Partnership related discourses.

The key components of the Mountain Perspective Framework were translated into Chinese, Nepali, Hindi, and Spanish (by collaborating researchers in the Andes) for use

by decision makers at different levels. MPF components have been used in a few major initiatives such as the Agriculture Perspective Plan (Nepal), the Himalayan Action Plan (India), the UNDP supported development initiative in Tibet Autonomous Region (China), and deliberations on the Environmental Strategy (Bhutan). A number of NGOs, with ICIMOD's guidance, have used components of the MPF in their fieldwork.

Within ICIMOD, the MPF was used in MENRIS training programmes; in the study of market towns and settlement patterns; in the study of globalisation and its implications for mountains, poverty, and livelihoods; and in a number of other initiatives.

The development policies in mountain areas of ICIMOD's RMCs were also reviewed using the MPF and shared with policy programme groups in the RMCs. The MPF is described by the external reviewers of ICIMOD as a major conceptual contribution (Coward 2003). ICIMOD's new strategy and programmatic framework (2008-2012) describes the 'integrated approach' with elements of MPF which were used at the programme planning level, not only at the national level, but also at the regional and global levels.

Gaining Wider Acceptance and Ownership by the RMCs

From its inception, ICIMOD's underlying goal was to achieve greater acceptance of its approaches and increased ownership of its programmes by its regional member countries. However, due to its relatively new agenda, inter-governmental status, and advisory role, progress understandably remained slow.

During the first 10 years, ICIMOD's efforts were concentrated more on creating, documenting, and sharing information and knowledge on mountain development principles and practices. The demand for GIS and RS tools and technologies was high, to which ICIMOD responded quickly and, therefore, became popular as a training centre among its member countries. In fact, during its development phase, ICIMOD was better known as a training and documentation centre, than as an applied research centre. Instead of dealing only with central government agencies, ICIMOD also started developing contacts and collaborative programmes with regional and provincial government agencies to work in mountain areas.

This approach, combined with a reciprocal response from the RMCs, took ICIMOD's activities where mountain specific issues and possible solutions needed greater attention. It also targeted ICIMOD programmes better to address key mountain specificities, i.e., socioeconomic marginalisation, physical inaccessibility, and ecological fragility. Gradually, ICIMOD's ecosystem-based innovative integrated mountain development approach and activities started to match its RMC's government programmes and priorities. Some examples of its new orientation are described below.

BOX 6: The process of gaining recognition and meeting expectations

The evolution of ICIMOD is partly reflected in the following statements made by RMC representatives in different meetings/workshops.

- We used to ask, 'What is ICIMOD?' (1988), now we ask, 'What can ICIMOD do for us?' (1995).
- ICIMOD used to be like a street vendor, trying to project and sell its products (1993), now ICIMOD acts as a mall, where people visit to obtain better/new knowledge input and advice (2007).
- Earlier, ICIMOD evolved and pushed advice and options on its own (1994), now ICIMOD designs and shapes options on a demand driven basis and in a collaborative manner (2007).

Increased ownership by the RMCs

Under its first five-year Medium-Term Action Plan (MTAP), which started in 2003, and its new long-term strategy introduced in 2008, ICIMOD has been reaching out to its eight regional member countries through more intensive consultation. The main aim is to better align ICIMOD's programmes with its RMCs' national programme needs and priorities.

The RMCs have responded positively to this new programmatic approach, and a strong indicator of their increased ownership is the marked increase in their annual financial contribution to ICIMOD's core budget. The RMCs have already committed to raising their aggregate share of the core budget from 7% to 12.5% by the end of the current five-year period ending in 2012. It is hoped that the aggregate RMC contribution will eventually reach one million US\$ per annum and cover approximately 25% of ICIMOD's operational budget.

Increased support in programme co-financing

As per its new strategy and second MTAP (2008-12), ICIMOD is increasingly designing scaled-up joint programmes in each RMC involving key national partners, especially government organisations (GOs). Through this carefully planned approach, ICIMOD hopes to contribute directly to improving the implementation of development programmes in the mountains of each of the eight RMCs and expects as a result to receive annual funding for the scaling up of programmes and operational activities. The project funds can come from larger development programmes as parallel or co-funding, but co-financing arrangements will further enhance national ownership of ICIMOD's regional programmes. ICIMOD is also intending to implement cost recovery arrangements for specific technical and scientific support for national programmes and organisations that are not covered by project finances.

Increasing the relevance and effectiveness of ICIMOD's programmes

ICIMOD will make specific efforts to increase the relevance and effectiveness of its programmes through its clear orientation and focus on adding value to national development programmes operating in the mountain regions of each of its eight RMCs, as well as achieving a greater positive impact on the wellbeing of mountain people. By systematically implementing this operational policy, ICIMOD expects to see a higher rate of adoption of its programmes by its national partners including GOs, NGOs, and CBOs. This will be possible through enhanced technical and scientific capacity of the staff within ICIMOD, as well as a pro-actively designed and run knowledge development and management cycle that will follow innovation systems and joint-production approaches to knowledge management in order to meet the specific requirements of ICIMOD's collaboration partners and thus improve the quality, deliverability, and sustainability of ICIMOD initiated and supported programmes in each RMC.

Addressing chronic poverty in the Himalayas

Realising that chronic and widespread poverty in all its dimensions prevails in a large part of the HKH mountains, and considering the fact that all the RMCs are signatories to the Millennium Development Goals (MDGs), ICIMOD has consciously redirected its programme-strategy to contribute to the achievement of MDG 1: halving national poverty by 2015. ICIMOD's programmatic approach in this regard is to focus on the improved management of water and hazards; ecosystem services such as biodiversity, forest, rangelands, and watersheds; and livelihood sources such as mountain niche products (for example, honeybees and medicinal plants) and services (for example, tourism and clean energy) to achieve a quick and lasting impact on the livelihoods of mountain poor and marginalised people, and especially women.

Poverty in the hills and mountains is generally attributed to physical characteristics, but the poor governance of development resources and programmes is equally responsible. Greater economic investment and the flow of suitable technologies into the region are essential to address the physical constraints. However, to improve governance and increase the voice of poor and marginalised people in decision making, there is a need for adequate and proper representation of all marginalised communities in the governance system of the country or province.

One of the contributors to poverty in the countries of the Hindu Kush-Himalayan region is the centralised system of government wherein marginalised people are excluded from the decision-making process. Unless this is corrected, poverty cannot be alleviated in the region. Under the centralised system, local institutions are merely an extension of the central level sectoral government line agencies. Programmes designed and implemented by the central government through sectoral line agencies have not succeeded in alleviating poverty or improving resource management. ICIMOD's new thrust linking upstream problems with downstream opportunities and vice-versa is a welcome change in helping reduce rural poverty.

BOX 7: Upland-lowland relationships and poverty: a different perspective

Over the years, ICIMOD has drawn attention to the dominance of the plains over the hills and mountains in most of the countries in the Himalayan region. Although this appears to be the case in many of those countries where the plains cover the largest area, contain most of the population, and are the base of the country's government system, in some situations the hill and mountain regions are dominant, covering the largest area and with the largest population. Hence, there is a need to give a balanced picture, and meaningful participation of the plains in decision making must also be ensured to capitalise on their potential for economic growth and national development. In Nepal, for example, the potential of the plains for development is very high; however, due to low investment in irrigation and physical infrastructure, the plains are as poor as the hills.

In Nepal, the Agriculture Perspective Plan (APP), prepared in the early 90s, placed a high priority on the installation of deep and shallow tube wells and the development of rural access and agricultural roads in the Terai. As the investment needed to implement the Plan has not materialised, the Terai is becoming poorer by the day. The young people of the Terai are migrating to foreign countries, as are those in the hills. This has contributed to the food deficit in Nepal and to poverty.

ICIMOD's Coming of Age

The last 25 years have been an important trial and testing period for ICIMOD, during which it developed meaningful programme partnerships with its RMCs, as described above. According to some RMC officials, this period was important to inspire ownership and ensure the functional involvement of the RMCs in ICIMOD's activities. The most challenging and rewarding outcome of this process has been the RMC government agencies' increased ownership of ICIMOD's programmes. In the early stages of ICIMOD, the RMCs were only represented in ICIMOD's governance, whereas in the current phase, there is not only representation, but more importantly increased participation by the RMCs in ICIMOD's programmes. The key factor that led to this progress was the realisation of the need for, and development of, an improved alignment between ICIMOD-supported programmes and government-supported national and sub-national programmes, ensuring greater participation by GOs, NGOs, and CBOs, which in turn increased RMC ownership in ICIMOD. ICIMOD is gradually matching its programme priorities with those of its RMC partners, especially its government partners, as demonstrated by the following:

- There is an increasingly better fit between the strategies, approaches, and activities of ICIMOD and those of the government agencies/decision makers in the eight RMCs dealing with mountain regions. This has increased the quality and frequency of interaction processes and led to more meaningful joint decisions and actions.

- ICIMOD can demonstrate convincingly some practical examples such as simple clean energy technologies, application of geo-ICT tools and technologies, suitable soil and water conserving agricultural practices, and in-situ/ex-situ management of high value products such as medicinal plants and honeybees. ICIMOD is improving the quality of its outputs and advocacy, which will encourage RMC decision makers to adhere to multi-sectoral and integrated approaches to development.
- Building on past work and replicable results, ICIMOD has embarked on evidence-based scaling up of good practices, which it hopes will convince the RMCs to enhance jointly planned and implemented programmes. The success of these efforts depends on how far ICIMOD is able to add value to national programmes in a complementary and synergistic manner. The increased collaborative activities between ICIMOD and RMC institutions are an indicator of success in this regard. This reflects a major shift in ICIMOD's programmatic approach, i.e., to establish and demonstrate its credibility and niche position by responding to the expressed needs of the RMCs. To sum up, ICIMOD is gradually understanding and embracing its RMCs' priorities and concerns in its programmes better and is able to mainstream them in its collaborative work to produce joint outputs over time.
- Strategic and sustainable partnerships based on a shared vision, mission, and objectives on major agendas such as poverty alleviation are considered to be the way forward to add value and create impact in the lives and livelihoods of mountain people. One such example is ICIMOD's strategic and collaborative partnership with Nepal's Poverty Alleviation Fund (PAF). In 2008, ICIMOD and PAF held discussions to plan a joint collaboration in Nepal to address poverty alleviation in selected hill and mountain areas. ICIMOD will provide new improved technology and technical assistance, while the PAF will provide the financial assistance to community organisations for the poor (COP). ICIMOD is also providing specialised training to some of the PAF staff in the application of GIS tools. Thus, this collaboration between PAF and ICIMOD will be mutually beneficial and the target group will draw considerable advantages. ICIMOD will then be able to disseminate the ground realities in terms of improved practices to other ICIMOD countries.
- Under ICIMOD's new strategy, regional cooperation and collaboration among the eight RMCs will be mediated through commonly required and generated data, information, and knowledge. ICIMOD's regional role in documenting and sharing knowledge can be used to take the lead in convening medium-term and long-term applied research based on the latest scientific know-how – often accessed from the global knowledge base – so as to produce frontier knowledge and cutting-edge solutions to help address future problems such as climate change, globalisation, human security, and the growing need to create knowledge-based societies.

Conclusion and Future Directions

ICIMOD's evolutionary history, positive current status, and promising future strategies allow us to be optimistic about ICIMOD's increasing role, recognition, and relevance in addressing the increasingly severe problems faced in the HKH region. After learning lessons from its 25 years of work and periods of conceptualisation, gaining acceptance for the idea of 'integrated mountain development' and seeing it put into practice, and following the development of constructs such as the 'Mountain Perspective Framework', which defines the uniqueness of the mountain situation, ICIMOD feels strongly that it has the foundation to design and implement viable options for sustainable mountain development. ICIMOD is already recognised as a) a focal point for applied research in a number of areas; b) a multidisciplinary centre for the systematic exchange of knowledge and information in the HKH region; c) a regional focal point for specialised training of partners in different fields including GIS/RS and community initiatives; and d) a centre that fosters networks and partnerships regionally and globally to address mountain issues.

Looking into the future, we consider that in order to enhance the Centre's visibility, credibility, and effectiveness, ICIMOD must do the following:

- 1 Maintain the central emphasis on the mountain context and the imperatives of mountain specificities as outlined in the Mountain Perspective Framework, while addressing complex issues with knowledge and anticipatory or forward planning
- 2 Improve linkages amongst ground realities, research-based understanding, and development change analysis at the local level with macro-level policy reform and implementation processes
- 3 Identify, assess, document, and replicate best practices/success stories from specific micro-catchments to broader landscape level mountain areas by involving the respective RMC partners
- 4 Develop a variety of partnership arrangements, ranging from strategic to collaborative, for partnership-based work involving RMC government agencies, NGOs, universities, and rural communities
- 5 Facilitate and support community-centred initiatives and partnerships including those with a focus on community-owned resources and indigenous knowledge systems, and strengthen traditional institutions through iterative training and institutional capacity building
- 6 Link upstream-downstream concerns, highlighting their intrinsic relationship and potential synergies in the changing global scenario focusing on balanced regional development and the interdependence of each region and community

- 7 Develop large scaling up projects and programmes through programmatic partnerships with RMC organisations, especially government agencies, wherein the role of ICIMOD is to provide the latest know-how and quality technical advice
- 8 Respond in a timely manner to emerging challenges such as climate and environment change, globalisation, and economic migration, and capitalise on new opportunities such as carbon finance, through collaborative programme development and implementation
- 9 Move towards a think tank role by creating a suitable 'think tank' cell, within the organisation so that ICIMOD becomes a thinking institution that seeks out and makes available frontier knowledge to solve emerging and unexpected problems.

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4

Meeting New
Challenges: Agenda for
the Future from a
Scientific Perspective

The Hindu Kush-Himalayan Region: Common Goods or Common Concerns?

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Mountain Resources – Common Goods?

The interaction between human societies and environmental change in the very different climatic zones of our Earth has a long and complex history over thousands of years. But, in the second half of the 20th Century a period began of rapidly growing human impacts on all the different ecosystems of our planet, and especially on the Hindu Kush-Himalayan (HKH) region and its surrounding lowlands. Figure 1 gives an impression of this turbulent and dramatic process (McNeill 2005), which is unprecedented in the history of humanity in terms of magnitude, and which cannot continue with the same rate of population growth and resource use until the end of our century. The world population increased from about 3.85 billion people in 1972, to 6.1 billion in mid 2000.

Figure 1: The 20th century – Modern global environmental history.
A turbulent and dramatic scenario (adapted from McNeill 2005)

Driving forces behind environmental change		Scale of environmental change			
Human population	grew 4 fold	Freshwater use	grew 9 fold		
Urban population	grew 13 fold	Marine fish consumption	grew 35 fold		
Global economy	grew 14 fold	Cropland	grew 2 fold		
Industrial production	grew 40 fold	Irrigated land	grew 5 fold		
Energy use	grew 13 fold	Cattle population	grew 4 fold		
CO ₂ emissions	grew 17 fold	Life expectancy at birth globally (years)			
		1800: 30	1935: 35	1950: 45	2000: 67

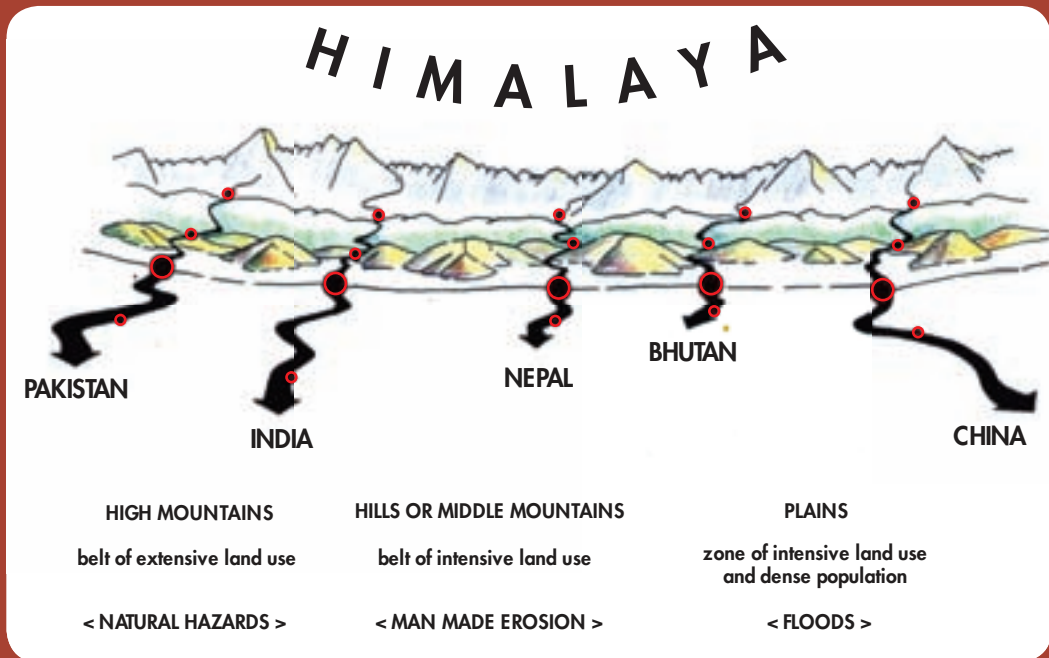
“Nothing like this had ever happened in human history. The mere fact of such growth, and its unevenness among societies, made for profound disruptions in both environment and society.”

Six countries accounted for 50 per cent of the annual growth; four of them are regional member countries of ICIMOD – India, China, Pakistan, and Bangladesh (UNPD 2001). This change, from a nature-dominated to a human-dominated global environment, will probably result in a further acceleration in the rate of environmental change and resource use, and an increase in the vulnerability of societies and economies. It becomes more and more evident that major natural processes – from the local to the global scale – are influenced by human activity, creating a much higher degree of complexity through the interaction of human and natural, economic and political driving forces (Messerli et al. 2000, Steffen et al. 2004).

The rapidly changing relationship between the continuously increasing world population and the available natural resources has provoked a new thinking about territorial issues and so-called 'common goods'. This is especially true for the mountain regions of the world with their significant resource treasures like freshwater, biological and cultural diversity, recreation areas, and many others (Debarbieux and Price 2008). The World Heritage Convention was probably the first successful approach to declaring selected natural and cultural places as representative of a certain type of common goods. This Convention provoked no significant political opposition because the protection and management of sites were placed under national law and responsibility (UNESCO 1972). Problems emerged when the discussion turned to transnational or global common goods like the atmosphere and the oceans, ecosystems like tropical rainforests and wetlands, and geographical regions like Antarctica. Without going into the complex arguments, scientific controversies, or political disagreements to each of these, the question can still be raised as to whether or not some mountain areas and their resources should be given the status of common goods?

As an example, it may be interesting to discuss the hydrological significance of mountains and highlands. On a global scale, very few measurement series exist, the periods covered are very limited, and evaluations of the spatial and temporal heterogeneity of discharge conditions are not yet satisfactory in relation to most mountain regions of the world. A preliminary approach to an assessment of the hydrological significance of mountain areas was undertaken using discharge data provided by the Global Runoff Data Centre in Koblenz, Germany. River basins in various parts of the world were selected as case studies. The relationship between mountains and lowlands was examined, primarily using gauging stations above an altitude of 1000m and in the vicinity of the river mouth. In addition, upper gauging stations were chosen that were situated in real mountain terrain with mountain topography, ideally as close as possible to the border between the mountains and plains (see Figure 2). Regional precipitation and temperature conditions were also taken into account in order to evaluate the discharge regime in the climatic context of the region. In general, mountain areas are characterised by disproportionately high discharge, typically about twice the amount that could be expected from the proportion of the area of the mountain section. Mountains account for 30 to 60% of total discharge in humid areas, while in semiarid and arid areas, the contribution is 50 to 90% with extremes of over 90% in some areas like the Nile and Orange rivers in Africa, the Amu Darya in Central Asia, the Colorado in North America, and the Rio Negro in South America (Figure 3). These and other findings were quantified and used to elaborate an

Figure 2: Highland-lowland interactions

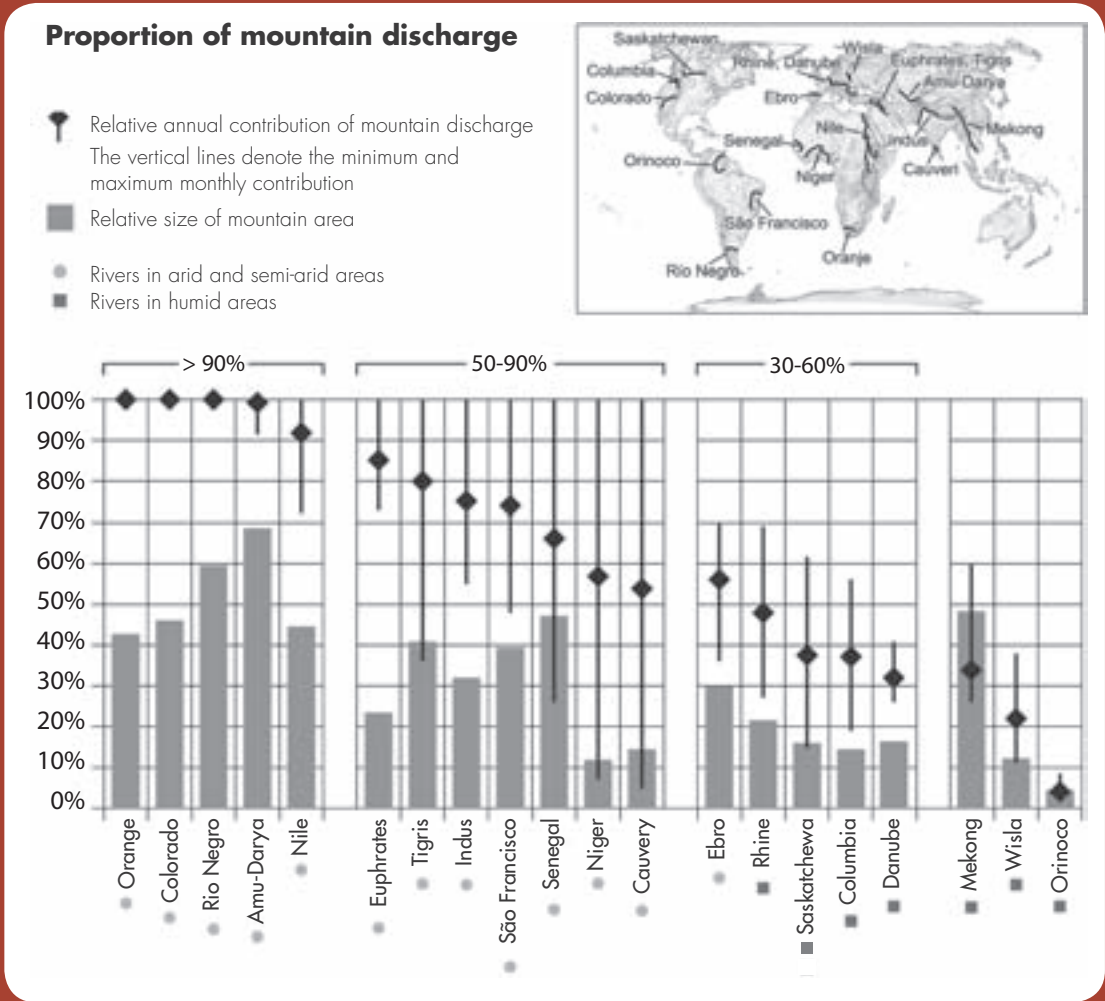


Research strategy for a better understanding of the water balance for every altitudinal ecosystem, from ice and snow down to the adjacent plains – precipitation, evaporation, runoff, erosion, sedimentation, and floods. Big circles represent the main stations in the transition between mountains and plains, small circles represent the mountain station network (Messerli, in Ives et al. 1987, p. 342).

overall assessment of the hydrological significance of mountain areas (Viviroli et al. 2003 and 2007). Without discussing this fascinating topic in more detail, this study reveals very clearly that the mountains of the world – differentiated for every climatic zone – play a very significant role in hydrology, and are particularly important in the most densely populated parts of the developing world. If we take into account that nearly all these rivers cross borders, then it becomes logical to speak or dream about mountain water flows as common goods.

From local to national levels, commons have been designated in mountain areas for many centuries. Collective management regimes have been common not only for pastures and forests, but also for water. The real breakthrough for mountains on a regional and global level was the Earth Summit in Rio de Janeiro in 1992, with its Agenda 21: Managing Fragile Ecosystems – Sustainable Mountain Development. The United Nations Food and Agriculture Organization (FAO) became the special, and most efficient, task manager for this mountain chapter. The International

Figure 3: Mean annual mountain contribution to total discharge of freshwater and proportion of mountainous areas. Vertical lines denote the maximum and minimum of discharge. For a further explanation see Viviroli et al. 2003.



Year of Mountains (2002) and the foundation of the Mountain Forum (1995) and the Mountain Partnership (2002) created the urgently needed awareness for the mountains at global level. The Food and Agriculture Organization (FAO), the United Nations Educational, Scientific and Cultural Organization (UNESCO), the United Nations Environment Programme (UNEP), the United Nations University (UNU), and various other international organisations became involved in mountain programmes. The last element in this too short global mountain history is the Mountain Resolution of the UN General Assembly on 12 December 2007, which consists of 42 paragraphs. The reasons

for the strong international and intergovernmental support for mountains is well expressed in Paragraph 3 of this Resolution, which “recognizes the global importance of mountains as the source of most of the Earth’s freshwater, as repositories of rich biological diversity and other natural resources, including timber and minerals, as popular destinations for recreation and tourism and as areas of important cultural diversity, knowledge and heritage, all of which generate substantial positive economic externalities” (UNGA 2007).

This very short summary on the growing significance of mountains and their resources, at local, national, regional, and global levels, combined with the overall idea of a certain type of common good is fascinating and stimulating – but not realistic! National sovereignty will never allow such a decision. However, is it not the case that the governments and people of the HKH region are all concerned about the changing climate, changing water resources, and changing ecosystem services in one of the most dynamically growing regions of the world? Is it not much more important to understand the common concerns instead of losing time discussing common goods? Are the main thrusts in ICIMOD’s new strategic plan not precisely about defining common concerns? In order to reach an understanding about common concerns, it could be helpful to discuss the common constraints and common challenges.

Mountain Environmental Change – Common Constraints

Changes in climate and hydrology are major constraints for all the member states in the HKH region, regardless of political borders. Few model simulations have attempted to specifically address issues related directly to future impacts of climate change in mountain regions, primarily because the current resolution of the general circulation models, and even the regional models, is too crude to adequately represent the complexity of the mountain topography. In mountain areas temperature and precipitation can change over very short distances in both horizontal and vertical dimensions. Downscaling techniques have often been seen as a very valuable tool for generating climate change information for mountain regions. But projections of changes in precipitation patterns are often unreliable because the effect of topography on precipitation is not adequately represented. Snow and ice are a key component of the hydrological cycle for many mountain ranges. The seasonal character and the amount of runoff are closely linked to cryospheric processes (IPCC 2007a). All this means that the projections available today for climate and hydrological changes for the HKH region must be taken as a regional overview, with a high degree of uncertainty. It is most interesting that in the recent report of the IPCC, even in the chapters about South Asia, the name ‘Hindu Kush-Himalayas’ appears rarely and is almost non-existent, in contrast to ‘Tibet’, which often appears as a steering element in the regional circulation models. Perhaps we can interpret this omission with the difficulties in the database, divided among eight countries without any coordination, and with too short and too few reliable measurement series. It would be a great advantage for all the HKH regional countries to have common and comparable data about temperature, precipitation, snow and ice, aerosols, and land cover change. ICIMOD and the HKH countries should keep in mind the following diplomatically formulated sentence in the last IPCC

report: “A lack of observational data in some areas limits model assessment” (IPCC 2007a, p.875). Thus today’s knowledge as presented in Figure 4 should be seen as a highly generalised overview; we can interpret it in the following way.

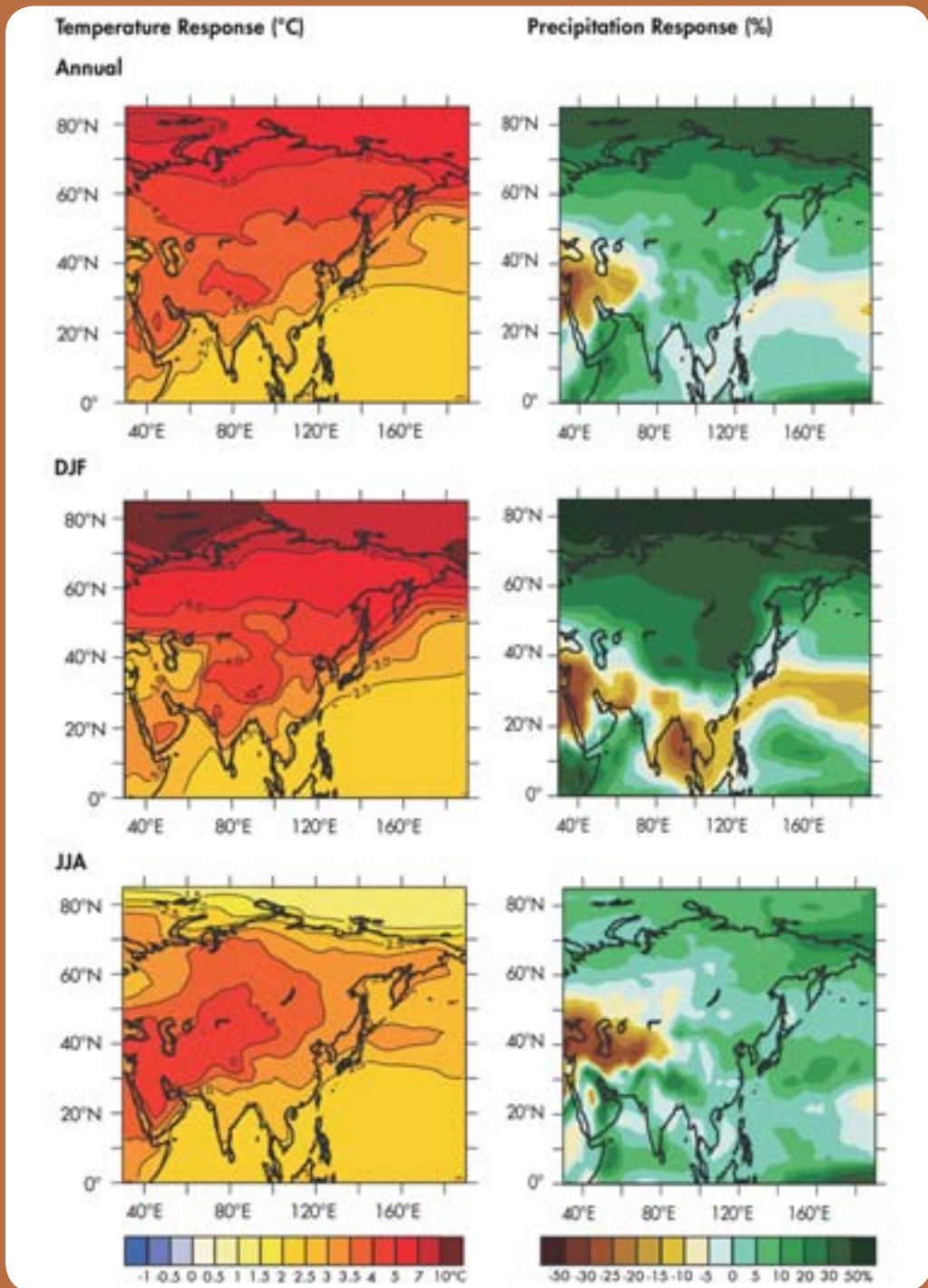
Temperature changes

A warming towards the end of the 21st Century of 3.3°C is projected for South and East Asia, greater than the global mean. Projections are much higher for the continental interior of Asia and the Tibetan plateau, with 3.7 to 3.8°C, and still higher for northern Asia, with 4.3°C. For most regions, the largest warming will occur in the winter months (Dec-Jan-Feb or DJF), but in central Asia the maximum warming will occur in the summer months (Jun-Jul-Aug or JJA). Downscaled projections indicate future increases in extreme daily maximum and minimum temperatures throughout South Asia due to increases in greenhouse gas concentrations. The greatest warming will be over the Tibetan plateau and at the highest altitudes (i.e., the greater Himalayas), which is interesting. This can be explained by the decrease in surface albedo associated with the melting of snow and ice (IPCC 2007a, p.883).

Precipitation changes

Boreal winter (DJF) precipitation is very likely to increase in Northern Asia and on the Tibetan plateau. Summer (JJA) precipitation associated with intense events is likely to increase in South Asia, even if the monsoonal flows and the tropical large-scale circulation are likely to weaken. There is an emerging consensus that the effect of enhanced moisture convergence in a warmer moisture atmosphere dominates over any such weakening of the circulation, resulting in increased monsoonal precipitation. Moreover, there seems to be a link between Eurasian snow and ice cover and the strength of the monsoon, with the monsoon strengthening if the snow cover retreats. Aerosols also have the same effect as greenhouse gases and can further modify monsoonal precipitation, as do modifications to the vegetation cover. Attention must be paid to the depressions and tropical cyclones generated over the Indian seas, which modulate the monsoon anomalies and can lead to damaging heavy rainfall events. This suggests that the spatial structure of warming in the Pacific will be relevant to these changes. Most important for the HKH region is the statement that most models indicate a general migration of seasonal tropical rain with maximum rainfall during the monsoon season to the North of the Bay of Bengal – even if it is poorly simulated by many models – and heavy rainfall over those regions with steep orography, with particularly large increases in Northern Pakistan and North-West India, as well as in North-East India, Bangladesh, and Myanmar. Interestingly, the annual number of rainy days may decrease by up to fifteen days over a large part of South Asia, but with an increase in extreme events and enhanced upward motion due to the northward shift of the monsoon circulation (IPCC 2007a, pp.879-887).

Figure 4: Temperature (T) and precipitation (P) changes over Asia, averaged over 21 models.
T and P change 1980-1999 and 2080-2099.



First column T: Annual mean – December, January, February – June, July, August

Second column N: Annual mean – December, January, February – June, July, August

Source: Climate Change 2007: The Physical Science Basis. Working Group I Contribution to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change, Figure 11.9 Cambridge University Press. Reprinted by permission of the IPCC.

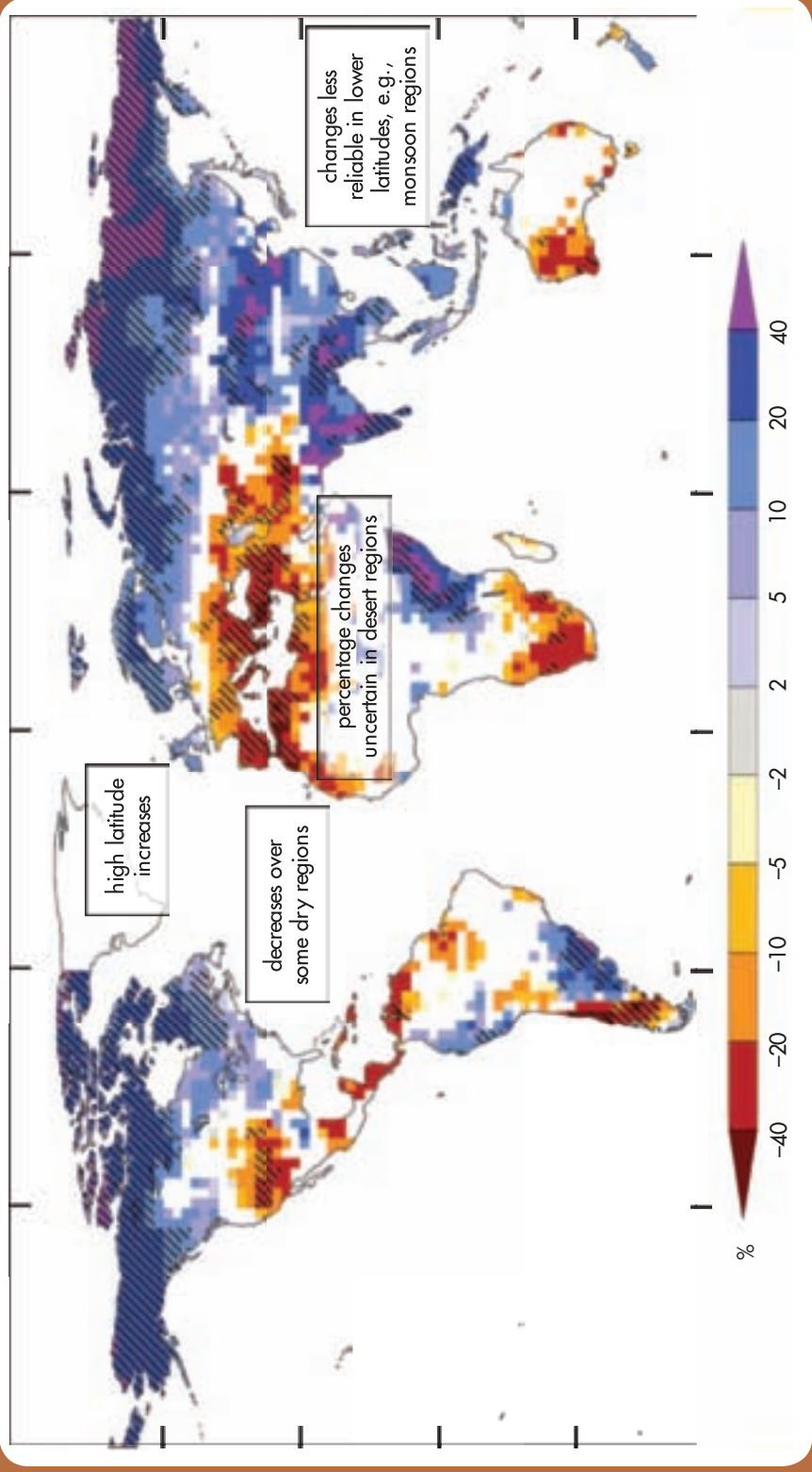
Runoff

Changes in precipitation and temperature lead to changes in runoff and water availability (Figure 5). Runoff is projected with high confidence to increase by 10 to 40% by mid-century at higher latitudes, and decrease by 10 to 30% in some wet tropical areas. The negative impacts of climate change on freshwater systems outweigh the benefits. Areas in which runoff is projected to decline face a reduction in the value of the services provided by water resources. The beneficial impacts of increased annual runoff in some areas are likely to be tempered by negative effects (precipitation variability, seasonal runoff shifts, and extreme events) on water supply, water quality, and flood risk. Twenty per cent of the world's population will live in areas where river flood potential could increase by 2080. Climate change is expected to exacerbate current stresses on water resources from population and economic growth, and land use changes including industrialisation and urbanisation. On a regional scale, mountain snow packs, glaciers, and small ice caps play a crucial role in freshwater availability. Widespread mass losses from glaciers and reduction in snow cover over recent decades are projected to accelerate throughout the 21st Century, reducing water availability and hydropower potential, and changing the seasonality of flows supplied by meltwater. In the IPCC report (2007b, p.49), it is stated that one billion people are dependent on mountain water resources, but from our knowledge of the HKH region, we believe that this figure must be much higher.

Constraints

Mountain regions react much more sensitively to climate change than the surrounding lowlands. Cross-border problems and processes or common constraints demand a stronger engagement of the scientific institutions of the HKH region, and this again could create a new understanding of the political authorities. In its new strategic plan, ICIMOD has formulated three main programmes: Integrated Water and Hazards Management; Environmental Change and Ecosystem Services; and Sustainable Livelihoods and Poverty Reduction, all of which will be seriously influenced by these ongoing and even accelerating changes, together with a fourth area as a basic tool, Integrated Knowledge Management and Capacity Development. If it is not realistic to declare mountain resources as common goods, we at least have to accept that the ongoing environmental changes are a common constraint which need solidarity and cooperation. If the HKH countries want more precise regional models to project potential changes, which form the basis of all mitigation and adaptation measures, then a coordinated network with comparable climatic and hydrological data is indispensable. Finally, we must keep in mind that natural resources such as water, forests, and ecosystems are already under considerable pressure from human activity. Climate change will add to that pressure, and it is the combined effect of global warming and these 'baseline' stress factors that matter when considering the impact of climate change on natural systems (OECD 2008).

Figure 5: Large-scale relative changes in annual runoff (water availability in per cent) for the period 2090-2099, relative to 1980-1999.



Values represent the median of 12 climate models. White areas indicate less than 66% of the 12 models agree on the sign of change and hatched areas that more than 90% of models agree on the sign of change. The global map of annual runoff illustrates a large scale and is not intended to refer to smaller temporal and spatial scales. In areas, where rainfall and runoff are low (e.g., desert areas), small changes in runoff can lead to large percentage changes. In some regions, the sign of projected changes in runoff differs from recently observed trends.

Source: Climate Change 2007: Synthesis Report. Contribution of Working Group I, II and III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change, Figure 3.5. IPCC, Geneva, Switzerland. Reprinted by permission of the IPCC.

Regional Mountain Development – Common Challenges

Population and economic growth will lead to an increased demand for natural resources. The lowlands in and around the HKH region and Tibetan plateau are some of the most dynamic regions with the highest growth rates in the world. These demographic-economic driving forces (also documented in Fig 1) must have serious consequences for the mountain regions. In other words, these processes present crucial common challenges, which need a higher level of attention from the scientific and political community and a special sense of responsibility towards highland and lowland populations. These challenges could include the following, for example.

Missing data for climate models and projections

The HKH region was, for the IPCC working groups, a so-called ‘white spot’, i.e., lacking a reliable database. If the countries concerned are not able to establish a well-coordinated network of climatic and hydrological stations with comparable data showing the impressive variety in these huge mountain systems from west to east and in some transects from north to south, including the instructive variety of ecosystems in the verticality, then we can never expect more precise regional models and projections as basic tools for mitigation and adaptation measures.

Observing the cryosphere and its significance for water resources

A careful and continuous evaluation of the changing ice and snow cover using fieldwork and remote sensing methods, is fundamental for estimating the potential change in the seasonality of water flows. It is astonishing to see in the Glacier Mass Balance Bulletin (WGMS 2007) that of the 127 glaciers regularly measured to provide a worldwide overview in this ICSU-UNEP-UNESCO-WMO supported programme, only two are in the HKH region – both in India (Chota Shigri in the Western Himalaya and Hamtah in Himachal Pradesh). The HKH countries need better and longer-term knowledge about the cryosphere, and need to be integrated in existing international networks, in order to gain a better understanding of ongoing environmental changes.

Water resources for sustainable development and food security

There are no runoff data available in the Global Runoff Data Centre in Germany for the most important HKH river basins (see Figure 3). In relation to food security, the Consultative Group on International Agricultural Research (CGIAR) started a ‘Challenge Program on Water and Food’ to grow more food with less water and to change the way we manage water for food, livelihoods, health, and the environment. This organisation estimates that 1.4 billion people live in water-stressed basins. By 2025, this number is expected to reach 3.5 billion (CGIAR 2006). Avoiding such a development will be a great challenge in the HKH region and in the water-dependent lowlands.

The FAO contributions to this topic, partly in cooperation with ICIMOD, are particularly important (ICIMOD and FAO 2006 and FAO 2005). FAO is currently preparing a publication of special significance titled 'Climate Change and Food Security'. Water and food could become a major challenge for the HKH water tower, especially considering the increasing population and rapidly growing economy of the region, with all its consequences for water supply in the adjacent lowlands. Hence, integrated studies about water and development in Himalayan watersheds are very important tools for calibrating climate change projections (Schreier et al. 2006). Finally, let's keep in mind that 2005-2015 is the UN International Decade for Action 'Water for Life'!

Climate change and disaster risk reduction

The IPCC report (2007b) shows a high probability that heavy rains and extreme events could increase in the monsoon region. This will have effects on runoff, erosion, sedimentation, and floods. Disaster risk reduction (DRR) will become a much more important challenge for the HKH region. Cross-border regional cooperation with early warning systems and transparent data exchange will be indispensable. Moreover, glacier retreat will produce an increasing number of lakes inside or just outside the rapidly changing permafrost zone and, therefore, special attention must be given to the potential for glacial lake outburst floods (GLOFs). Disaster risk reduction will depend on optimal teamwork between remote sensing experts and highly competent fieldwork specialists. Equally important is the rapidly growing amount of construction of small and large dams for hydropower and water retention. The last years and months have shown impressively the catastrophic effects of earthquakes and extreme rainfall on these man-made constructions in mountain areas (ICIMOD and UNEP 2007, Zimmermann 2008). Perhaps we should think about how the mountains of the world will look in the middle or at the end of our century. Perhaps in every mountain valley we will see a series of dams for energy, irrigation, urbanisation, and industrialisation?

Heavy rainfall and floods are normal processes of nature. They only become catastrophes because of human construction and habitation. If climate change is becoming a reality, do we have to correct the changing seasonal water flows with technical constructions? The conclusion is clear: reliable data about changing climate and hydrology all over the HKH region is vital to disaster risk reduction, especially in the coming decades.

It may be of interest to note that I proposed a research project more than 20 years ago, in a learning process during the first five years of ICIMOD, for a fully equipped training and experiment site in Nepal (Messerli in Ives et al. 1987), hoping that other countries in the region would follow suit (Figure 2). The donor agencies didn't see any priority need for such a project. It failed, but the idea survived and is perhaps even more important today with regard to environmental change. Information about the whole cycle, from precipitation and evaporation, to runoff and soil moisture, is fundamental for a better understanding of the connections between climate change and ecosystem services, biodiversity, land use, and livelihoods at different altitudes.

Preserving biodiversity, ecosystem services and protected areas

The UN General Assembly declared 2010 as the International Year of Biodiversity. What will be the contribution of the HKH region? ICIMOD and other institutions have published several most interesting reports in connection with biodiversity, forestry, land use, and protected areas, but an overview of the HKH region is still missing. We should keep in mind the fascinating variety of ecosystems and landscapes represented, with annual precipitation of less than 0.2m in the most western part, and more than 2m, and in some places exceeding 4m, in the eastern part. Moreover, the dominant precipitation in the south is caused by the summer monsoon circulation, and in the north and over Tibet, by the boreal winter circulation. All this means that biodiversity and ecosystem services are highly diversified, and a regional approach with selected test sites representing these highly different sub-regions is urgently needed. A planned conference in November 2008 will determine if such a comprehensive approach is realistic and feasible.

The Millennium Ecosystem Assessment (MEA) published a synthesis report for decision makers with some excellent tables to explain the complexity of ecosystem services (Figure 6). Changes in drivers that indirectly affect biodiversity, such as population, technology, and lifestyle (upper right corner of figure), can lead to changes in drivers that directly affect biodiversity, such as fishing or the application of fertilisers (lower right corner). These result in changes to ecosystems and the services they provide (lower left corner), thereby affecting human wellbeing. These interactions can take place on more than one scale and can cross scales. For example, an international demand for timber may lead to a regional loss of forest cover, which increases flood magnitude along a local stretch of a river. Similarly, the interactions can take place across different time scales. Different strategies and interventions can be applied at many points in this framework to enhance human wellbeing and conserve ecosystems (MEA 2005).

Figure 6 provides an excellent guideline for a common approach to the very different ecosystems from the warm lower to the cold higher belts, and from the extreme dry to the extreme humid parts of the HKH mountain system.

The changing environment and impacts on livelihoods

Global and regional climate change projections are highly generalised and we have discussed how difficult it is to downscale the results to the valley or village level. However, higher temperatures and more extreme precipitation and runoff events can be assumed. If we want to apply these changes to a certain place or village and its population, then we first have to understand the human-natural system. An instructive example has been developed for the village of Bagrot in the Karakorum as shown in Figure 7 (Winiger and Börst 2003).

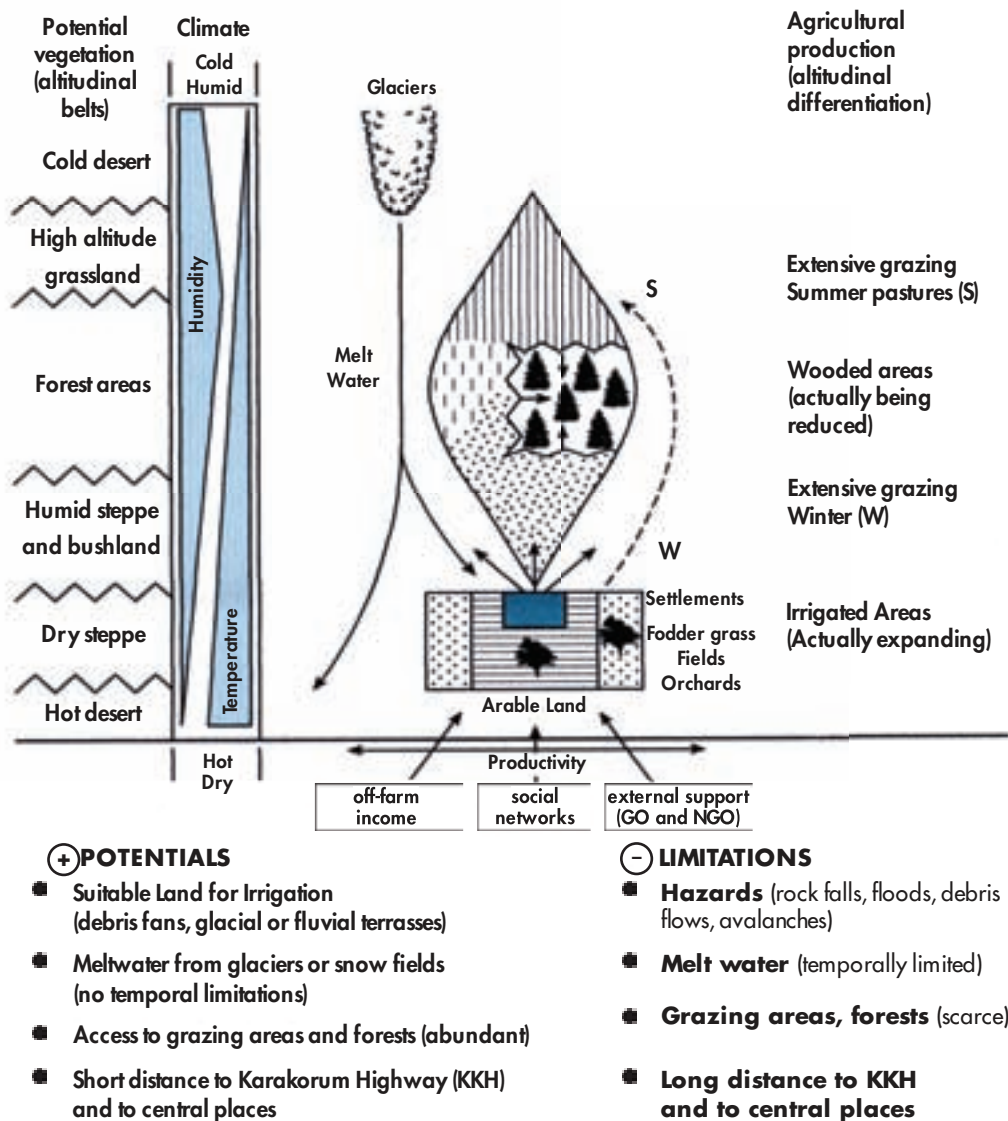
Winiger and Börst analysed climate and hydrology, irrigated and non-irrigated land use systems, and summer and winter grazing land in different altitudinal belts. Based on this information, the

Figure 6: Millennium Ecosystem Assessment: conceptual framework of interactions between biodiversity, ecosystem services, human well-being, and drivers of change.



Taken from Millennium Ecosystem Assessment, Ecosystems and Human Well-being, Synthesis (MEA 2005), p.7. Reprinted by permission from the World Resources Institute, Washington

Figure 7: Conceptual analysis of the village of Bagrot in the Karakorum, Pakistan – Vertical arrangement of natural vegetation and agricultural productivity



This basic knowledge is an important tool for observing and measuring future environmental changes (slow trends and extreme events) in order to understand and disentangle natural and human driving forces and to prepare the necessary adaptation measures in time. For further explanation see Winiger and Börst 2003.

potential and limitations could be evaluated, and changes in natural and human systems could be integrated and used for projections. The authors showed the changes in the land use structure with lower or higher temperatures: two harvests per year below 2000-2500m, less productivity with increasing altitude (also for irrigated land), and vegetation or desert in the valley bottoms depending on the amount of precipitation. The distance to the next road, in this case to the Karakorum Highway, determines cash crops (e.g., seed potatoes), and if there is a monetary market system or self-sufficient agriculture in isolated areas, with all the implications for livelihoods, and poverty. Such schemes, adapted to different climatic sub-regions, and also to different cultural sub-regions (World Bank and DFID 2006), could provide an excellent base to enable local communities to observe and understand any degree of human or naturally induced environmental change.

Migration can also have serious effects on the balance between potentials and limitations. Migration can lead to serious social problems and a missing labour force, which must be replaced by national and even international migration from neighbouring mountain areas. The World Bank (2008) has analysed the significance of migration and the amount of remittances in countries of the HKH region. For Nepal, the stock of emigrants is around 750,000, compared to a total population of 28 million. In 2007, remittances were US \$1,600 million, or almost 20% of GDP. In Pakistan, the number of emigrants is 3,420,000 compared to a population of 159 million, with remittances of US\$ 6,100 million. It is a pity that we do not have separated data for highland and lowland emigrants, hence, the figures for Nepal and Pakistan must be interpreted cautiously and the figures for China, India, and Bangladesh do not provide any mountain relevant interpretation. There is no or insufficient data for Bhutan, Afghanistan, and Myanmar.

The above-mentioned common challenges are by no means complete; they are more an answer to the main constraints of changing climate, water resources, and ecosystem services. Two points are of special interest. First, environmental change concerns natural resources and human wellbeing. Without bridging the gap between natural and social science studies, especially in a time of ongoing climate change, we shall never understand the livelihood conditions in a mountain environment (Messerli and Messerli 2008). Second, it is exciting to see in these different sections about common challenges the interaction between global, regional, national, and local scales. The constraints of climate change are presented on a global or continental scale, the challenges are shifting between regional and local levels, and the Millennium Ecosystem Assessment (Figure 6) tries to connect global, regional, and local levels in a short-term and long-term assessment.

Regional Mountain Cooperation – Common Concerns

An unpublished report by UNEP (2007) shows a fascinating, but politically difficult, process in and for the mountains of the world (Figure 8). Mountain systems are usually home to several independent countries. These countries usually begin to cooperate regionally because they experience common constraints and must overcome common challenges for sustainable

Figure 8: Existing mountain conventions and planned new initiatives for new conventions
(UNEP 2007)

Strengthening mountain partnerships through legally binding agreements: Challenges and opportunities

(UNEP, FAO, Mountain Partnership, EU)

Alpine Convention (1991), 1995, 2002
Carpathian Convention (2001), 2006

Initiative for the Caucasus
Initiatives for south-east Europe
Initiative for the Central Asian mountains

Consortium for Sustainable Development of the
Andean Region (CONDESAN)
International Centre for Integrated Mountain Development
(ICIMOD) in the Himalayas, 1983

development, one example is the Alpine Convention, which led to the Carpathian Convention, both legally binding agreements. These conventions have a high significance for science and policy in mountain areas, and also for development and cooperation.

UNEP is supporting new initiatives in mountain regions where there are many ongoing conflicts like the Caucasus, the Balkans, and Central Asia (Figure 8). The road to a solution to these conflicts will be long and difficult, but no sustainable or long-term development will be possible without a certain degree of cooperation. The goodwill of the local population is very important, but this will grow with the engagement of the scientific community and the political authorities, and will depend on the improvement of the system supporting their lives.

The responsibility of the scientific community

The International Council for Science (ICSU 2006) published the following statement in its strategy plan 2006-2011: "Strengthening science for society means being aware of the emerging developments in science and the potential of science to address societal needs. Science is a cooperative exercise that thrives on open international interaction and exchange. It transcends national boundaries". ICSU Statute 5 is even more important for the future of the HKH region: "The Principle of the Universality of Science is fundamental to scientific progress. This principle embodies freedom of movement, association, expression and communication for scientists as well as equitable access to data, information and research materials. ICSU actively upholds this principle, and, in so doing, opposes any discrimination". China, India, Pakistan, Nepal, and Bangladesh are members of ICSU. This means that the scientific communities of these countries have a responsibility to intervene if certain data, for example concerning climate change and water resources, are classified and not accessible. Water resources in the HKH region are a common concern. The statements of ICSU and the universality of science are highly relevant to such common concerns, otherwise "it can have serious consequences for science and for society" (ICSU 2006: p.39).

The responsibility of political authorities

Adopted in 1991, the Alpine Convention brought together all the Alpine countries and the European Community to collaborate on mountain development and protection, and has provided much inspiration in this regard, particularly in Europe, Asia, Latin America, and Africa. Following this, the International Year of Mountains 2002, also had a very positive effect on new initiatives.

The Carpathian Convention entered into force in 2006, only five years after the first initiative by the government of the Ukraine. Collaborative arrangements such as the Alpine and the Carpathian Conventions have proven themselves to be useful approaches and powerful incentives for mountain-related action and support (UNEP 2007). In relation to successful political cooperation, focusing on a river basin could be of great interest in the HKH region. As an example, I quote the headlines of the International Commission for the Protection of the Rhine (ICPR 2008): "Nine states – one river basin. For the benefit of the Rhine and of all its tributaries, the members of the ICPR Switzerland, France, Germany, Luxemburg, Netherlands and the European Commission successfully cooperate with Liechtenstein, Austria, Belgium and Italy". Focal points of this cooperation are the sustainable development of the Rhine, its floodplains, and the good state of all waters in its watershed. In 2003, a new convention for the Rhine entered into force. Currently, activity is focused on the following objectives and tasks: the chemical and ecological state of the river; holistic flood prevention and flood protection; and the implementation of European regulations and directives. Progress since 2003 is impressive: water quality and the biological state of the river have improved; animal and plant species have increased; flood retention areas have been created; and, since 2006, salmon and other fish are again migrating upstream from the North Sea.

Another example is the 1995 Agreement on Cooperation for the Sustainable Development of the Mekong River Basin. Water sharing is discussed between the four lower riparian states, Thailand, Vietnam, Laos PDR, and Cambodia; however, China and Myanmar are not yet fully participating (UNU 2008). After two decades of work by the international law commission, an international convention has not yet entered into force.

Mountain conventions or river conventions not only point the way to the future, but also show the political difficulties in reaching the goal. Climate change and scarce water resources will increase the pressure to avoid conflict and find peaceful solutions. We should keep in mind the following quotation: "If there is a political will for peace, water will not be a hindrance. If you want reasons to fight, water will give you ample opportunities" (Loneragan 2005).

Figure 8 should remind us that ICIMOD was founded long before the Alpine Convention and, I may add, that the Hindu Kush-Himalayas are probably more vulnerable than the Alps, as the common constraints and concerns discussed above show. As we have seen, the concept of common goods may not be realistic, but common concerns are a reality, and our common future is also a reality. Solidarity and cooperation between large and small nation states are crucial to manage these common concerns, and for this great task ICIMOD could be the meeting point. But ICIMOD can only fulfil this role if there is a will for solidarity and dialogue, and for economic growth in harmony with the natural environment. At the beginning of the new millennium, Kofi A. Annan, UN Secretary-General said on 5 June 2000: "We celebrate the World Environment Day in the knowledge that environmental issues are inextricably linked to those of peaceful coexistence, international cooperation and economic development".

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Towards a Better Common Present

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The term 'sustainable development' came into widespread use following the submission of the report titled 'Our Common Future' in 1982 by the UN Commission on Environment and Development, chaired by Ms Gro Harlem Brundtland. The thrust of the report was a plea to adopt lifestyles and development strategies that would help to harmonise the needs of today and tomorrow, so that short-term goals do not jeopardise long-term development opportunities. In other words, equity in ecological terms should cover both intra-generational and inter-generational time dimensions. By choosing the title 'Our Common Future', the Brundtland Commission wanted to emphasise that whatever our political frontiers may be, ecologically, our fate is intertwined. This is clear from the potential impact of anthropogenically induced changes in climate, leading to adverse changes in temperature and precipitation, with the resultant droughts and floods as well as a rise in sea level.

Swaminathan (1988) emphasised that there can be no better common future without a better common present. This calls for mainstreaming the social dimension in development strategies. The social sustainability of development pathways is as important as environmental and economic sustainability. This is because it is the poor nations, and the poor in all nations, particularly children and women, who suffer the most from the adverse impacts of unsustainable development. The goal of sustainability science is, therefore, the mainstreaming of the principles of ecology, economics, social and gender equity, and ethics in all technology development and dissemination strategies. At the operational level, this will involve adopting a pro-nature, pro-poor, pro-woman, and pro-livelihood approach to designing research and development programmes. The biovillage model of human-centred development fostered by the MS Swaminathan Research Foundation (MSSRF) is based on this concept.

The three major components of sustainability science are awareness, analysis, and action. Education is the key to awareness generation. Alienation from nature has resulted in children developing what Richard Louv (2005) has termed 'nature deficit disorder'. Nature deficit disorder among children leads to attention deficit disorder, depression, and obesity. The following two steps can help to prevent the onset of the nature deficit disorder:

- 1 First, students in every school and college can be trained to prepare a 'Charter for Nature' for their respective village, town, or city. Such a Charter will help youth to understand the state of the life support systems like land, water, biodiversity, forests, and common property resources in the place where they live and study. Another aspect of the

Charter for Nature is an understanding of the population supporting capacity of the ecosystem. This will help to underline the need to stabilise human and animal populations to the level that the ecosystem can support in a sustainable manner.

- 2 The tools of information communication technology (ICT) like the internet, cable TV, FM radio, and mobile phones provide uncommon opportunities for spreading information on the science and art of sustainable development. The internet-mobile phone synergy helps to achieve last mile and last person connectivity and provides an excellent opportunity for spreading ecological literacy.

The UN Millennium Development Goals (MDGs) represent a global common minimum programme for sustainable human security and wellbeing. The eight MDGs to be achieved by 2015 provide a pathway towards sustainable human security. Among them, the first relating to the elimination of hunger and poverty is the most important for creating the substrate conditions of peace and security vital to sustainable development. The Roman philosopher Seneca said over 2000 years ago "A hungry person listens neither to reason nor religion, nor is bent by any prayer". The green revolution in wheat and rice of the 1960s provided a breathing space for achieving a balance between population growth and food production. Even before the term 'green revolution' was coined by Dr William Gaud of the US Department of Agriculture in late 1968, I cautioned against adopting agronomic practices that will undermine the green revolution and convert it into a greed revolution. Addressing the Indian Science Congress on 4 January 1968, at Varanasi, I said,

"Intensive cultivation of land without conservation of soil fertility and soil structure would lead ultimately to the springing up of deserts. Irrigation without arrangements for drainage would result in soils becoming alkaline or saline. Indiscriminate use of pesticides, fungicides and herbicides could cause adverse changes in biological balance as well as lead to an increase in the incidence of cancer and other diseases, through the toxic residues present in the grains or other edible parts. Unscientific tapping of underground water would lead to the rapid exhaustion of this wonderful capital resource left to us through ages of natural farming. The rapid replacement of numerous locally adapted varieties with one or two high yielding strains in large contiguous areas would result in the spread of serious diseases capable of wiping out entire crops, as happened in the Irish potato famine of 1845 and the Bengal rice famine of 1942. Therefore, the initiation of exploitative agriculture without a proper understanding of the various consequences of every one of the changes introduced into traditional agriculture and without first building up a proper scientific and training base to sustain it, may only lead us into an era of agricultural disaster in the long run, rather than to an era of agricultural prosperity."

I later introduced the concept of an 'ever-green revolution', to enhance productivity in perpetuity without associated ecological harm. There are two major ways of achieving an ever-green

revolution – organic farming and green agriculture. Organic farming precludes the use of mineral fertilisers, chemical pesticides, and genetically modified crops. Green agriculture, in contrast, permits the use of integrated pest management, integrated nutrient supply, and other agronomic methodologies that involve the use of the minimum essential chemical fertilisers and pesticides. For farmers with cattle and other forms of livestock, organic farming is easier.

The conservation of natural resources like soil, water, flora, fauna, and forests will ultimately decide the future of agriculture. In this context, the conservation of the Himalayan ecosystem is extremely important, as demonstrated by the wide range of studies carried out by the scientists of ICIMOD. ICIMOD has shown how the ecological, geological, and hydrological security of the Himalayas can be protected and enhanced. The integrity of the Himalayan ecosystem will also decide the fate of Indo-Gangetic agriculture, which is the breadbasket of India. There is a growing apprehension that damage to Himalayan soil and water resources, as well as its priceless biodiversity, is increasing due to anthropogenic pressures. Floods are increasing on the Indo-Gangetic plains, both in severity and frequency. The early ice melt in the Himalayas and the receding of glaciers will cause more frequent floods resulting in enormous damage to life and livelihoods. Because of the profound influence of the Himalayas on the wellbeing of the people in the plains, the Government of India has included a Mission for Sustaining the Himalayan Ecosystem under its National Action Plan on Climate Change.

The effective implementation of the Mission for Protecting the Himalayan Ecosystem will depend greatly on the vast amount of knowledge gathered by ICIMOD. The Himalayas hold great spiritual significance in the minds of millions of people on the Indian subcontinent; they are the priceless heritage of humankind. ICIMOD, as the custodian of this invaluable blessing of nature, will have an even greater role to play in protecting not only the agriculture of the Indo-Gangetic plains but, more importantly, the life support systems that make it possible for nearly a billion people to sustain their livelihoods.

To conclude, if farm ecology and farm economics go wrong, nothing else will go right in agriculture. The ever-green revolution technologies show the way to sustainable agriculture. This again will be possible only if harmony with nature becomes a non-negotiable human ethic.

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Preparing the Himalayas to Meet the Challenges of Climate Change: An Area for ICIMOD to Take the Lead

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Challenges

The world has changed profoundly since ICIMOD was established 25 years ago. The principal global environmental problems of the present day, such as climate change and the spread of invasive alien species, were barely public issues in the 1980s. Changes have also occurred in many other ways. The world today is much more globalised and inter-connected. Migration is now a widespread global phenomenon with new places affected by the movement of people. The effects of migration on mountains may include prosperity, as well as depopulation and the degradation of hill slopes. Among the countries with Himalayan connections, China and India are slated to become the future economic powers of the world. Nepal, where ICIMOD's office is located, now has a democratically elected government and is on the way to shedding the last vestiges of monarchy. However, life in the Himalayas is hardly any better. Inaccessibility, marginality, isolation, and poverty, which are generally associated with mountains, still affect the people of the Himalayas. Although some 'trickle-down effect' from the growing global economy is evident, Himalayan people remain poor with only a limited amelioration of physical hardships, in spite of the development of road networks and information technology. In many areas, the supply of ecological services has actually decreased. Firewood continues to be the main source of cooking energy. Literacy has increased substantially; however, water supply per person and its quality are on the decline. Dependence on lowland areas for food has increased (Table 1). Social conflicts continue to trouble the Himalayas, and wars, insurgencies, and forced human migration are integral components of the mountain societies.

In brief, while deforestation and resultant hazards such as erosion and floods were major concerns in the 1980s when ICIMOD came into existence, climate change and its consequences are the major threats now. It is ironic that people who barely have access to fossil fuel are the most vulnerable to the global warming caused by its combustion. In this article I attempt to (i) briefly analyse the strategy employed by ICIMOD all these years to tackle the various problems and challenges that humans encounter in mountains; (ii) discuss the importance of the Himalayas in relation to climate change; and (iii) give an outline of what more could be done to achieve the desired level of impact on the development processes of the Himalayan region.

Table 1: Changes in the Himalayas during the last 25 years (primarily based on experiences in India and Nepal)

Parameter	Change (+increase, - decrease)
Environmental background	
<ul style="list-style-type: none"> Deforestation Forest degradation (e.g., due to lopping of branches and forest litter collection) Loss of springs Water pollution Damming of rivers Erosion Biodiversity Fire frequency Forest composition Spread of exotic invasive alien species 	<p>Not as alarming as predicted in the 1980s</p> <p>Continues to be a matter of concern</p> <p>Continues to be a concern</p> <p>+</p> <p>+ a matter of much debate</p> <p>High, but poorly documented</p> <p>Poaching a serious problem; lichens and native bamboos also badly affected</p> <p>+</p> <p>Spread of pines (<i>Pinus roxburghii</i>)</p> <p>+</p>
Forest management and conservation	Still very much state governed, but more participatory than in the past with the strengthening of village level institutions, particularly in Nepal. The importance of biodiversity, carbon, and other ecosystem services is now being realised.
Climate change	
<ul style="list-style-type: none"> Temperature rising Glaciers retreating 	<p>Reported to be more than global mean</p> <p>Faster than elsewhere</p>
Social Factors	
<ul style="list-style-type: none"> Poverty Sex ratio Out migration Literacy Participation of women and socially weaker sections Forest dependence Dependence on lowland areas for food Fruit production Use of modern energy <ul style="list-style-type: none"> for lighting for cooking Road network and transport Social Conflicts 	<p>Marginal reduction</p> <p>-</p> <p>+</p> <p>+</p> <p>+</p> <p>Still very high</p> <p>Still high (nearly 50% of the total food requirement in many areas)</p> <p>+</p> <p>+</p> <p>Negligible</p> <p>+</p> <p>+, insurgency, violence, discontent in many areas</p>
Research	Still poor, perhaps on decline in most countries, except China.

ICIMOD's Strategy to Address Problems

Over the past 25 years, ICIMOD's primary strategy to address the problems of the Himalayan region has been (i) identification of the problems; (ii) development of projects in collaboration with one or two partners and applying for grants; and (iii) implementation of projects either alone or in collaboration with partners. Clearly, in this 'do alone or in partnership approach' the number of projects that can be carried out is limited by the number of staff working at ICIMOD, which was always small. I argue in this article that, apart from this strategy, ICIMOD should play the role of a facilitating agency for a number of institutions working in the Himalayan region. Given the vastness and heterogeneity of the Himalayan region, not much can be achieved through one or two institutions. ICIMOD can play the role of a facilitator by developing a consortium of institutions and individuals working in the Himalayan region, and by contributing to the development of a scientific base for the Himalayan countries. With this approach, ICIMOD would be able to function on a much larger scale bringing about changes in developmental processes. However, the task of networking could be enormous.

Significance of the Himalayas in Global Climate Change

Consisting mainly of an east-to-west arc of mountain chains more than 2500 km in length, the Himalayas are viewed with great, often divine, respect throughout much of Asia. The respect originates from their extraordinary dimensions, and the presence of a great variety of plants, which has led to the development of a famous oriental medicine system. The Himalayas determine the climate for much of South and East Asia, where more than half of the global population will live in the future. The economy of this region owes a lot to the rivers (ten river basins are connected with the Himalayas) that flow from the Himalayas-Karakoram-Pamir-Tibet high mountain region. The Gangetic system alone supports about 500 million people. These mountains of extraordinary height (the region contains 9 of the 14 tallest peaks in the world, including Everest at 8,848m) keep the adjacent plains in the south warm and moist by intercepting cold winds from the north and trapping the moist winds rising from the oceans in the south. The establishment of the monsoon pattern of rainfall in Asia is attributed to the rise of the Himalayas. The immature topography of these young and still rising mountains (established 30-40 million years ago) is highly vulnerable to erosion and landslips. The extraordinary altitudinal range has led to the establishment of a variety of forest types (more even than in the Amazon), ranging from tropical dipterocarp forests along the foothills to alpine forests of fir, birch, rhododendron, and juniper (Singh and Singh 1992). The region has some 9000 plant species, of which about 3000 are endemic.

The Himalayas have more snow and ice (about 35,000 km²) than any other part of the world outside the polar caps. The Himalayan glaciers have not only produced perennial rivers, they also play a significant role in influencing climate through their albedo effect. There is evidence to suggest that the Himalayas are warming at a faster rate than the global average, and many of the Himalayan glaciers are receding at faster rates than glaciers in other regions (Xu Jianchu et al.

2007). The impact of the disruption of this hydrological linkage on the Himalayas and the Gangetic system is not known. A significant upward shift in the optimum elevation of species is reported to have already occurred during the last century in different parts of the world (Lenoir et al. 2008), and species migration is likely to be much more rapid in the future with more warming. Being one of the largest wilderness areas in the world, the Himalayas provide shelter to species migrating under the influence of temperature increases. Thus, the region is of great importance in any adaptation strategy dealing with climate change. It may be pointed out that much of the success in the green revolution in India and Pakistan was based on the plains, which are served ecologically by the Himalayan rivers.

Socially too, the Himalayas are going to draw public attention in the warming world, as many changes in human migration and economic activities are likely to occur in the future. Controversies over the construction of dams and the relationship between deforestation in the Himalayas and floods in Bangladesh have never completely subsided.

Lack of Data on Climate Change and the Role of Himalayan Forests

Except for some fragmentary data on glaciers, almost nothing is known about the Himalayan region with regard to climate change. The IPCC, in its recent report, refers to the Himalayas as a 'white spot' (region of scarce data). The region doesn't even have an adequate number of meteorological stations, let alone a carbon tower for measuring carbon fluxes. We have not yet collected data on the phenological responses of trees and birds to climate change, even though Himalayan forests are known for their rich biodiversity, ecosystem services (particularly carbon sequestration), and biophysical impact on climate change. Recent modelling exercises indicate that, depending upon several factors including the type of the forest, snow cover, and other environmental conditions, forests can have a cooling, as well as a warming effect on climate (Bonan 2008). There is a need to investigate the role of Himalayan forests from the standpoint of their biophysical impact on climate. The high forest cover (up to 3000-4000m in altitude) is a big source of vapours that are released through evapotranspiration. To what extent can their cooling effect moderate global warming?

Possible ICIMOD Initiatives

Climate change is the overarching environmental shift that can affect our future in many ways. Being the most important institute in the mountains, ICIMOD has a major responsibility to address the issues related to climate change and the sustainable development of mountains and the adjacent plains. The following objectives may help ICIMOD to set its long-term climate agenda:

- 1 To train students in conducting research and writing articles in research journals

- 2 To develop a network of institutions and individuals to educate and conduct research on climate change in relation to the Himalayas
- 3 To create climate-based courses for the Himalayan region and incorporate these in university curricula
- 4 To promote understanding of the geo-ecological and anthropogenic connections between the mountains and plains

Dr Schild, the present Director General of ICIMOD, has already taken some steps towards developing a consortium of Himalayan universities, with the support of several outside institutions interested in the Himalayas. The Himalayan University Consortium (HUC) at its first meeting decided to initiate several mountain specific courses in Himalayan universities. Attended by the vice chancellors of universities from all the major Himalayan countries (India, China, Pakistan, Nepal, Afghanistan, and others), the Consortium decided to begin with a graduate course on climate change in the Himalayas. The purpose of the Consortium is to run courses, as well as to develop centres of excellence in research on issues like mitigation and adaptation to climate change, greenhouse gas profiling of energy production, and ecosystem responses to climate change.

The relative position of Himalayan countries in science is still low. With the exception of China, which is making great progress in science, the ranks of the Himalayan countries, measured in terms of research published in cited journals, is on the decline. In some countries, research processes have yet to be established.

In India, for example, fresh talent is attracted to industry and service sectors, not many are interested in research and academia. The few that remain in academia go to biotechnology, pharmaceuticals, and the like, where there are more jobs. Ecology and other disciplines that involve people and field studies are not favoured. The Indian universities themselves are not in the best health as far as research is concerned. Isolation and lack of access to journals and outside contacts over several decades has made the Indian university system moribund. Although some of these obstacles have been partly removed, and more money is now available in universities, there has been little progress in recent years, and India's position among the countries of the world is declining continuously (8th in 1980, 13th in 1990, 21st in 2005). The problem is not only that the number of research publications per person is low, the number of scientists is also inadequate. India has 157 research and development scientists/engineers per million, which is 1/50th of that in South Korea and 1/30th of USA or Japan (Prathap 2004). In addition, the scientific knowledge base is weakest in mountain states. The result is that, with a few exceptions, all excellent research papers on the Himalayas are being contributed by outsiders, despite the creation of a number of research institutes and universities in the Himalayan region, at least in India. There is a need to overhaul the system. Immediate solutions need to be found, as waiting for science in Himalayan countries to come into its own will take too long. There are a few steps that can easily be taken by ICIMOD in collaboration with other institutions. Research students in the Himalayan region need training in (i) how to do ecology and other field studies, and (ii) how to write research papers for

quality journals. Unfortunately, universities and institutes in the Himalayan region do not have properly organised systems to address these issues. The problem is so acute that reviewers of research journals often return research manuscripts, as they need to be re-written. ICIMOD could train 200-300 researchers in these two areas in a period of three years or so with the help of the human resources available in Himalayan universities and research institutes and outside organisations interested in the Himalayas.

A good linkage between Himalayan institutions as well as linkages with institutions outside the region will go a long way in improving the research capacity of local people on Himalayan issues. Good training and mentoring to 200-300 students over a period of time may prove to be a good beginning.

Research and Education on Climate Change through Networking

It is strongly felt that, at least in some places, courses on Himalayan-specific issues need to be conducted. A certain level of education and training is necessary to carry out such activities. ICIMOD needs to develop a network of experts on the Himalayas to achieve the goal of combining teaching and research on the region. The programme could be started with climate change, the overarching environmental shift on a global scale which is going to affect all spheres of our planet and life.

ICIMOD can develop several mechanisms to create a network for climate change in the Himalayas: (i) create chairs for top-notch experts so that the continuity of the academic groups that they represent is maintained; (ii) contract the services of these experts for a few days or weeks to run a course or assist in developing research programmes; and (iii) continue to develop the Himalayan University Consortium, for which preliminary steps have already been taken.

Taking Up the Cause of Mountains in International Forums

ICIMOD needs to create a mountain group and take up its cause at various forums – regional, continental, and global. Whatever data we have on climate change, they clearly suggest that mountains are among the most vulnerable regions on the planet; perhaps elevated surfaces are warming faster than lowland areas. Interestingly, mountains are not identified as a separate group in international meetings on climate change (COPs). In order to have effective representation of mountains at various meetings dealing with climate change, ICIMOD should have a backing of reliable data published in proper research journals. This may be costly, but there is no other way to participate effectively in debates involving several parties. The success of negotiations largely depends on (i) scientific evidence, (ii) educating people, and (iii) the commitment of the concerned governments.

To represent the Himalayan case in international forums, we need data, for example on the role of Himalayan forests in carbon storage and the scale of forest degradation and deforestation, and their impact on CO₂ emissions, the mass balance of glaciers, river flows, and so forth.

Network of Long-Term Ecological Research Stations

ICIMOD can contribute to establishing a network of research stations along the lines of the National Ecological Observatory Network (NEON) and the long term ecological research (LTER) stations, representing the various ecoregions of the Himalayas (see box). Apart from gathering meteorological data, these stations need to be equipped to monitor the carbon fluxes of ecosystems, the phenological responses of key species, the direct impact of forests on climate (through evapotranspiration and albedo effects), and changes in agricultural systems and people's perception and possible adaptation measures. Although the Himalayas are not known for their extensive agricultural fields, mountains can be used to develop effective adaptation strategies. For example, rising temperatures can severely affect wheat production in the Indo-Gangetic plains, which has played a major role in overcoming food shortages in the previous century. If wheat can no longer be produced in sufficient quantities in the plains, the foothills could be used to grow wheat in certain areas. The natural vegetation lost in the process could be developed in areas rendered unsuitable for the cultivation of crops due to global warming.

Conclusions

No single organisation alone can address the issues of sustainable development. Being one of the largest and most complex wilderness areas of the world, the Himalayas present difficult problems to those interested in environmentally sustainable development. ICIMOD, or for that matter any organisation, is too small to have a perceptible impact on the Himalayas. However, it can play the role of an effective facilitator, given the name and prestige that have come to be associated with it. Much of its success in addressing the needs of a sustainable future will depend on its capacity to establish linkages with and between various Himalayan institutes, universities, and individuals. However, this alone will not be enough. ICIMOD must take a few immediate steps to create a healthy research culture in the Himalayan countries, employing the services of experts who continue

Long-term ecological research (LTER)

LTER was initiated in the USA about 30 years ago by the National Science Foundation (NSF). Subsequently, the National Ecological Observatory Network (NEON), the Global Lake Ecological Observatory Network (GEON), the Water and Environmental Systems Network (WATERS), Oceans Observatory Initiative (OOI), and National Phenology Network (NPN) were established. Their synergies may lead to many new research areas.

"All these networks recognise the importance of coordinated sampling that allows information for multiple sites in disparate environments to address the basic ecological question: How to meet the needs of a sustainable future in an increasingly connected world?" (Robertson 2008)

to be active. Adequate 'research literacy' is necessary to collaborate effectively at the international level. Until now, ICIMOD has not taken any serious initiative in this direction. What ICIMOD usually does is collaborate directly with other institutions. The scale of its collaborations remains small, as the number of persons working at ICIMOD is limited. Such collaborations could be expanded several-fold by promoting networks involving all those who work in the Himalayas, or are interested in the region and are capable of making a contribution. In that case, the role of ICIMOD has to be primarily one of a facilitator. To achieve this, the organisation would require a different kind of strategy and competence. In Dr Schild, ICIMOD has a determined and passionate leader; the chances of success have never been so bright as today.

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The Environment of the Tibetan Plateau and its Sustainable Development

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Long-term studies of the formation, evolution, and zonal differentiation of the environment of the Tibetan Plateau have provided a significant scientific foundation for its resources utilisation, environmental protection, and sustainable development.

Introduction

The Tibetan Plateau covers a quarter of the land area of China and is the region with the highest elevation on Earth. It has unique environments and ecosystems and is a critical region for response to climate change.

Over 35 years ago, in 1973, the Chinese Academy of Sciences (CAS) organised a series of integrative expeditions on the formation, evolution, environment, and development of the Tibetan Plateau with multi-disciplinary scientists from institutions and universities from all over China. This was followed by a scientific expedition in Xizang Autonomous Region (Municipality) in the 1970s. Some other scientific surveys were carried out in the Hengduan Mountains, Namjagborwa area, and Karakorum-Kunlun and Hon Xil area in the 1980s. In the 1990s, a project on the formation and evolution, environmental changes and ecosystems on the Tibetan Plateau was initiated by the Ministry of Science and Technology in conjunction with CAS. The project 'Formation and Evolution of the Tibetan Plateau and its Resources and Environmental Effects' was funded by the National Basic Research Program of China from 1998 to 2003. Following this, a further project on the 'Environmental Evolution of the Tibetan Plateau and its Response and Adaptation to Global Changes' was again funded by the National Basic Research Program of China from 2005 to 2010.

The Chinese Academy of Sciences, as a representative of China, has energetically joined in the activities of ICIMOD since its inception 25 years ago. ICIMOD, as a regional intergovernmental knowledge, learning, and enabling centre has successfully played the role of providing regional knowledge synthesis, training and capacity building, and advisory services for sustainable livelihoods and poverty alleviation. The results of CAS's studies of the environment and regional sustainable development on the Tibetan Plateau have made, and will continue to make, a good contribution to ICIMOD's mission.

Natural Environments of the Tibetan Plateau

The uplift and tectonics of the Tibetan Plateau have formed a wide variety of high mountains and deep valley patterns, on which the Himalayan mountain range, the Tanggula mountains, and the Kunlun mountains make an imposing landform framework. The elevation of the Tibetan Plateau averages about 4000m above sea level and reaches heights of 7000-8000m in the mountain areas. With high topography and a cold climate, the Tibetan Plateau has a vertical differentiation arranged in a clear pattern from the low-mountain tropical zone, to the mountain sub-tropical zone, plateau temperate zone, and alpine frigid zone.

The topographic configuration and atmospheric circulation determine the horizontal differentiation between natural vegetation zones. From the southeast to the northwest of the Plateau, vegetation changes successively from montane forest, through shrub and alpine meadow and alpine steppe, to arid desert.

This vast mountainous territory has a largely ethnic population. In this region, the natural resource that we consider to be most important, and which will probably receive most of our attention in the coming years, is water, which is fast becoming a very scarce resource. Six of the largest rivers in the world originate on the Plateau and hundreds of millions of people in China, South East Asia, and South Asia depend for their livelihoods on the water that these rivers carry to the plains. Therefore, the Tibetan Plateau is not only an important support system for social and economic activities, but also an ecological umbrella for east and south Asia.

Ecological Umbrella for East and South Asia

We would like to propose the term 'ecological umbrella' to describe the Tibetan Plateau, because it plays a very important role in protecting the environment and providing livelihoods for a large part of Asia, and even the rest of the world.

The Tibetan Plateau has been called the 'Roof of the World' and contains the greatest concentration of glaciers and permafrost soils outside the poles. According to reports, there are 34,465 glaciers on the Plateau, with a total area of 46,300 square kilometres. The Tibetan Plateau contains 77.4% of the total number of glaciers in China, and 82.6% of the total area of glaciers. These glaciers are the origins of rivers and provide freshwater for the millions of people living on the plateau, and also for the billion people living beyond.

The Tibetan Plateau has the greatest density of lakes in China. These numerous blue lakes and ponds form the highest plateau lake system in the world, present some of China's most superb landscapes. The total area of lakes on the Tibetan Plateau is approximately 38,000 square kilometres, about 38% of the total area of lakes in China.

Under the influence of their monsoon climate, the deep mountain valleys and secluded ravines are a sanctuary for a number of ancient forest trees. They can be classified into more than 100 families and 300 genera. Virgin forests cover about 113,000 square kilometres, with a volume of some 2.3 billion cubic metres. The forests growing in the deep mountain valleys and upper reaches of big rivers are of significance in the control of soil erosion, for water conservation, and as carbon sinks.

Grasslands cover about 50% of the total land area of the Tibetan Plateau and are important sources of food for animal husbandry and as carbon sinks. Livestock breeding also plays a large role in the socio-economic structure of the Plateau.

Farmlands cover about 0.5% of the total land area of the Plateau, mostly distributed in the basins, ravines, and valleys. Over the last decades, agricultural scientists and farmers have improved crop structures and increased crop production by introducing new breeds and varieties and by improving management techniques. The Plateau agriculture, with its enriched crop species, is unique among high-altitude farming systems in the world.

Sustainable Development of the Tibetan Plateau

Over the last 30 years, long-term studies of the formation, evolution, and zonal differentiation of the environment on the Tibetan Plateau have provided a significant scientific foundation for its resources utilisation, environmental protection, and sustainable development. China's central government and local governments are highly concerned about environmental protection and regional sustainable development of the Tibetan Plateau. A series of countermeasures have been efficiently implemented in the Plateau; examples include the following:

- In the south-eastern part, in the Hengduan Mountains, efforts have been made to convert farmlands on the steep slopes to forests and to rebuild farmlands on the gentle slopes into terraces to optimise project coordination and areal combination to strengthen the integrated control of soil and water loss and carbon sinks.
- In the rangelands, efforts have been made to implement the rangeland contract system of responsibility and to license the use of grasslands, and to develop artificial grasslands to overcome forage deficiencies in winter and spring.
- A network of field observations has been established in typical ecosystems to monitor the results of countermeasures and to collect long-term data for the study of environmental changes on the Tibetan Plateau.
- All engineering and industrial construction projects must conduct an assessment of their impact on the environment before implementation to ensure the balance between resource exploration and environmental protection.

We are very happy to see that the issues of environment and sustainable development have been included in ICIMOD's strategy. We anticipate that Chinese scientists will cooperate with ICIMOD on climate change, water and hazard management, and ecosystem services in the Hindu Kush-Himalayan region, and will make a new contribution to sustainable development in the region.

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Meeting New Challenges: Agenda for the Future from a Development Perspective

Climate Change and the Hindu Kush-Himalayan Region: Implications for Agriculture, Food, Poverty and Livelihoods

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Pakistan should be eternally grateful to the mountain regions for they provide life to the plains of the Indus in the Punjab and Sind provinces of Pakistan. The mighty Indus and its western tributaries are the irrigation system of Pakistan. The country is held together by this irrigation system, which provides the people with enough food to meet their needs. Pakistan's largest dam is situated on the Indus at Tarbela with an initial capacity of 7.63 million acre feet (maf) of water. When the dam came into operation, Pakistan's GDP jumped by about 87% and helped a food deficit country that was surviving on PL 480 (food aid programme) handouts to come to terms with itself.

The Tarbela dam is snow filled and depends on glacier melt for its flow of water. This year the melt has been excessive and the rivers of the regions are in high flood. This means an excess of water, but it is also a warning that the glaciers are receding. As a student I recall walking on the glaciers in the month of August, and as late as 1987, I recall that snow and glaciers nearly made us abort our mission to Gilgit and Hunza, the two major cities of the region. Last year I was shocked to find that glaciers were nowhere to be seen in the Hunza region. If we compare the experience of 1987 with that of 2007, then the glacier and snowmelt has been so excessive that the receding snow line is now roughly 1300 kilometres away (give or take 5% either way).

There is another danger facing the country and no one has yet taken note of the potential consequences. The Tarbela has decreased its storage capacity by 2.5 maf. The farmers in the plains have been demanding that another dam be constructed at Kalabagh without realising that the dam can only be useful if there is more water. Due to poor watershed management, an estimated 67 million tons of silt from eroded land enters the Tarbela dam each year; what amount leaves the dam is not known, nor is any effort made to determine this. The silk route poses another danger: that of landslides, with approximately 100 occurring each year along the route. These landslides occur due to manmade activity. While developing this road, engineers blasted the fault line in the ranges instead of circumventing it, but then engineers will be engineers. All this mud is

thrown in to the Indus River as there is no other alternative. This earth eventually finds its way into the Tarbela dam.

The proposed dam at Kalabagh is not additional, but a replacement for the lost storage capacity of the Tarbela dam. Despite repeated commitments by the Government, the Kalabagh dam has now been shelved for the time being. In its place, the Government has suggested the Bhasha dam, situated at the border of the North West Frontier Province (NWFP) and the Northern Areas. The site for this dam is very near Chilas and the President of Pakistan has already performed the groundbreaking ceremony. Due to its location at the boundary of the NWFP and the Northern Areas, the Bhasha dam suffers from technical, environmental, ethnic, and social issues. These are complicated issues and will require not only the deepest commitment, but also deft handling by the Government. The site of the dam is reported to be faulty and there is disagreement among technical staff as to whether or not the three mountains are stable. The experts feel that at least one of the mountain ranges is porous and that the site will not be able to hold the required amount of water. Besides, the stored water has its own hydraulic forces to contend with. If the height of the dam is increased to 600 feet from the original 300 feet the pounding will have two affects. One, it will submerge the all-weather road and the next road alignment will have to be along the snow line at the very top of the range. Second, dams change environmental factors and the growing climate change is due to manmade activities. No human has the ability to predict the consequences of, and take evasive action to avoid, environmental disasters. Natural disasters have also increased in frequency.

The ethnic and social issues are considerable. The district of Chilas will be under water. Where are these people to be settled? Mountain people do not like to live in the plains and, in any case, they will be out of their cultural context. Uprooting populations is next to impossible and, given the culture of our people, will lead to grave consequences. Furthermore the Chilas district is Sunni and the other districts are Shiite, with the Ismaili Shiites predominant. The development programme launched by the Agha Khan has preferred areas where the Ismailis are predominant. So prejudice is going to play its part and an ethnic conflict cannot be ruled out. Prior to 1987, there was no ethnic conflict and no criminal record in the police stations, but since the development projects have started with a preferential bias the conflict over development has increased, and there is now regular conflict. The gap that was stable between the ethnic groups has now widened. The development gap is fraught with danger as these very communities were living peacefully before the advent of development.

Climate change is going to substantially impact on food security, poverty, and people's livelihoods. ICIMOD has been identifying these issues, but whatever action has been taken was nullified by the organisational and political difficulties that Pakistan has faced. It has had political governments, and it has had military governments. Military governments are supposed to be tough in their attitude, and do perform, but more often than not these tough decisions backfire if they are not based on cogent reasons. So if the snow line keeps receding, the likelihood that Pakistan will

become severely arid cannot be ruled out. Pakistan may well be facing the scenario of a desert country like, say, Somalia.

The impact of this on livelihoods in the plains will be devastating. Steps need to be taken to ameliorate the poverty factor and protect the livelihoods of the people in the area. The tragedy of the dams is that we have been like the prodigal son wasting resources. Pakistan is only 27% efficient in the use of its water resources. The better course would be to improve the use of water. Water efficacy is important. If the Bhasha dam is constructed, the positive side is that the Northern Areas will receive some royalties, which is important as the area has limited funds.

The technologies that ICIMOD can provide could have a far reaching impact. One technology brought to Pakistan by ICIMOD was the seabuckthorn plant, for which appropriate areas were identified, and the benefits of which could have been considerable. However, the ICIMOD project focused only on the supply side of the development of the commodity. No one tried to work on the demand side. As the product had medicinal properties, the Ministry of Health was asked to register it as a medicine for the treatment of disease. Evidence of its application to alternative medicine was provided, but it met the fate of all medicines and all confrontations with the multinational corporations. No matter how hard people try, the multinational corporations will not grant the consumer the right to choose. They have 91% of the pharmaceutical market and are heavily entrenched in the entire medicine market – and all the personnel in the Health Ministry and the medical practitioners play along.

What can ICIMOD do to change this? Seabuckthorn has the potential to be a major source of income and improve the livelihoods of people in the arid mountain areas. Seabuckthorn would not only provide economy wide benefits, it would also save on expensive medical bills – generating wealth and improving social welfare. ICIMOD identified the biological aspects and allowed Pakistan access to the crop in China. The study group saw and understood its implications. Support was needed for product development, marketing, and the cost of manufacturing of machinery. It was not much in those days, but ICIMOD felt unable to respond as it was a research organisation. So is ICIMOD not interested in making the intervention successful? This is a shortcoming, not only of ICIMOD, but of the entire Consultative Group on International Agricultural Research (CGIAR) system. The same is true for the excellent biodiversity of the area, especially in relation to medicinal plants. Efforts should be made to develop and market such plants. Artemesia and other herbs, such as cumin and the like, are found in these areas. These should be domesticated and agronomic practices for cultivation developed. In retrospect, all the good work that was done by ICIMOD has been wasted because of the conventional strategy followed. Good work could have gone on to excellence.

Similarly, the breeding of angora rabbits and the development of products from their fur could have been encouraged. I did get some of these ideas across, and ICIMOD did train one lady in this (Nusrat) and she did well, but we Government functionaries fall foul of the powerful hierarchical

organisational hurdles in our own country. When that happens, all the good work that should have continued is dismantled. This is the nature of the political system; it is unwise to seek a rational explanation for this and develop a system based on certainty.

Again, the sloping agricultural land technology (SALT) was well formulated and could have been taken further. Indeed, now that I live in the low mountains north of Islamabad (it is easier to shift from the plains to the mountains than vice versa) I have realised the value of the technology that I initially learnt from ICIMOD. I have a garden of half an acre at an altitude of 2500 feet above sea level. It provides 70% of my vegetables; seasonal fruit such as apples, pears, loquat, mangos (efficiency requires that the mango plant be at shoulder height), bananas, citrus (all kinds); lemon olives, *m. oleifera* for edible oil; jaman, avocado, and some trees such as juniper, and teak – with tropical and temperate trees growing together. In addition, I have a fishpond and meat from home sources. There are innumerable rose bushes, bamboos (seventeen species), and pine trees, not to speak of the rosemary and other herbs that I grow. All these plants are growing together (companion planting) and, as I am short of water and have to make every drop count, these plants are in storey planting. This is a frost area, but I have learned to deal with and drain out the frost. There are novel ways to handle frost.

The lessons that one learns are continuous, and I suggest that ICIMOD takes on an even more imaginative intervention. I have to mention again that if I had not been associated with ICIMOD these interventions would never have been there. Now the world stands on its head and I have taken on another challenge, but I maintain that any bald mountain can be made productive. The Northern Areas, especially, have been my pet regions, they make me feel that the definition of lake has to change. The mountains opposite Bhasha are full of water, but that water is not being utilised. The trees that are growing there are land races, but what stops temperate fruits from growing there? Nothing. So that is the next frontier to cross.

There are any number of opportunities, but the fate of interventions like the growing of eucalyptus trees should be avoided. Eucalyptus have been planted by people unaware of the difficulties that arise when thoughtless interventions are implemented. The shallow root structure of the eucalyptus tree has led to soil erosion. An orientation course for scientists that come to ICIMOD may be necessary so that they understand and are sensitive to the requirements, not only of people, but also of nature and its many facets. Similarly, fruit trees were planted that had fungus, causing a real scare.

The North does not need any chemical fertilisers, because the minerals in the stones slowly release NPK for fertiliser, as well as a host of micro fertilisers. Similarly, bio pesticides are the order of the day and the local land races provide a clue as to the way forward. If the world of the mountain people is forced to change, a new and arrogant nature would be required with no apologies. Poverty anywhere is manmade and due to the selfish policies of the few to the detriment of the welfare of the many. Can ICIMOD make a difference?

Let me not belabour the points too much and suffice it to say the following:

- A demand and marketing strategy should be developed.
- Agriculture conservatism should be put aside and bold interventions taken. Scientific certainty is a myth and if Newton's laws can be challenged why not more ruddy ones?
- Nature farms should be developed in which resource poor farmers are taken to places within their own budgetary resources. I do not consider finances to be essential. Some may be necessary, but it is knowledge that is essential and critical.
- Products rather than commodities should be developed.
- Venture capital should be established for these people for they have a lot of good common sense.
- Encourage people to develop gardens for wellbeing, in which they can grow plants to treat minor ailments at home. Such plants are extremely simple to grow. Give the people a chance to live healthily and well, and to have the pleasure of their own house garden. You could take care of blood pressure, prostate difficulties, coughs and colds, and maybe even have your own shoe polish (I have not purchased shoe polish for over ten years, but instead use a particular fallen flower).
- Provide fertiliser tea for your plants the easy way.
- A weed is a plant whose value you do not know.
- Let apiculture be across the spectrum of interventions. Bees are very egalitarian and manage to rob from the rich to help the poor.

I used to provoke the audience and say that given a free hand, the income of the farmers of the Northern Areas could be more than that of the irrigated areas of the Punjab and the Sind. Life ordained in nature is relaxing and fulfilling. I would like to invite ICIMOD to come and see for itself at my house in Pakistan. ICIMOD has done wonders, but the cognitive ability of each individual has its own limitations. Cognitive dissonance is what ICIMOD has to worry about. Do not let anyone mark time. I wish ICIMOD well, for it can deliver, but that will depend on whether or not there are people at ICIMOD who will simply not get along or get along. The dimensions are such where the limitations are many. I intrinsically believe in the goodness of human nature and its ability to be compassionate. When we are one with ourselves we are at peace with others.

Great was this opportunity to share some thoughts with you. I do believe in ICIMOD and its abilities.



Impacts of Climate Change on Himalayan Water and the Need for Regional Transboundary Cooperation

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The freshwater systems in the Himalayan region are continuously undergoing natural changes in terms of quantity and quality. These changes are accelerated by the increase in human exploitation of water resources caused by increasing population pressure and rising levels of urbanisation and industrialisation. Growing concern for environmental degradation has further increased pressures on water resources. These pressures are intense within national borders and even more intense in the case of transboundary rivers, where two or more countries share the same river basin. There is clear evidence that Himalayan glaciers have been melting at an unprecedented rate in recent decades. This trend is causing major changes to freshwater flow regimes downstream and is likely to have a dramatic impact on drinking water supplies, biodiversity, hydropower, industry, agriculture, and more, with far-reaching implications for the people of the region and for the Earth's environment. The growing competition for the water resources of transboundary rivers and climate change across countries are expected to intensify the potential for acute upheaval and conflict in the region.

Bangladesh lies the farthest downstream of three of the mightiest river basins in the world: the Ganges, the Brahmaputra, and the Meghna. All three river systems originate in the Himalayas outside Bangladesh and terminate in the Bay of Bengal. The three river systems have a drainage area of about 1.75 million square kilometres with an average runoff of around 1200 cu.km, stretching across China (Tibetan Plateau), Bhutan, Nepal, India, and Bangladesh. These three rivers have a combined peak discharge of about 180,000 cumec during the flood season – the second highest in the world after the Amazon – and their waters carry about 2 billion tonnes of sediment each year. About 10% of the world's population (over half a billion) live in the Ganges-Brahmaputra-Meghna basins. 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 the regional population live below the poverty line, with a per capita income of US\$ 400 per year and daily calorie intake of less than 2100. Moreover, the region faces common problems of overpopulation and poverty, floods, droughts, and ecological imbalance. The frequency and severity of flooding of the Ganges-Brahmaputra-Meghna river basins is due to the amount and timing of precipitation, the condition of

* Mr Siddique passed away on 1 September 2008. He was a true friend of ICIMOD and his contribution will be remembered by all of us.

the basin, and upstream controls. One hazard associated with river flooding is riverbank erosion, due to the meandering behaviour of alluvial rivers. Climate change impacts have hindered economic development in the region and food security has been threatened. These impacts will increase further in the future.

According to the United Nations Environment Programme (UNEP), Bangladesh is ranked as the most disaster prone area in the Asia-Pacific. Flooding is a recurrent phenomenon. About 60% of the country is flood prone, and 20% of the land area is inundated during the monsoon season, even in a normal year. Catastrophic floods like those of 1988 and 1998 inundated more than 60% of the country's land area, causing damage to the people and the nation as a whole of about US\$10 billion. Throughout its 35-year history, Bangladesh has often found itself living under the threat of monsoon rains, cyclones, river erosion, droughts, and other meteorological hazards associated with a nation situated barely above sea level and having almost the highest population density of any country in South Asia and the world. In the Fourth Assessment Report of the IPCC, Bangladesh is identified as the most vulnerable out of 27 countries to the impacts of global warming induced accelerated sea level rise. The high degree of vulnerability of Bangladesh can be mainly attributed to its extensive low-lying coastal area, high population density, the frequent occurrence of cyclones and storms, high storm surges, and high rate of coastal environmental degradation due to pollution and non-sustainable development. Most of the people residing in the coastal zones are directly dependent on the natural resource base of the coastal ecosystem. A rise in sea level could result in the loss of cultivable land to inundation, salt intrusion into coastal ecosystems and into the groundwater system, and the loss of terrestrial and marine biodiversity. The Sundarbans, which are already experiencing high salinity, will be affected more by saline water intrusion due to increased sea level, both in the dry and monsoon seasons.

The Government of Bangladesh has developed a strong and effective institutional framework at the national and local level for mitigation and preparedness for all disasters including cyclones. In November 1985, the Government of Bangladesh introduced the 'Standing Orders for Cyclones', and, in 1999, the Ministry of Food and Disaster Management issued the revised 'Standing Orders on Disaster'. The Standing Orders are guidelines for different functionaries at the national, divisional, district, upazila, and union levels of government and for non-government agencies in relation to action to be taken at different stages of a disaster. They clearly spell out what is to be done, when, and by whom. The Standing Orders have received praise from the international community for the effective handling of cyclones and other natural disasters in the past. the Government of Bangladesh is currently developing a climate change strategy and action plan.

The Government of Bangladesh approved the National Water Policy in 1999 and the National Water Management Plan (integrated water resources management, NWMP) in 2004. The NWMP is a comprehensive document, covering a period of 25 years from 2000-2025, with a total of 84 programmes. Due to the threat of flood and the uncertainty of water availability during the dry season, Bangladesh can't firmly plan water resources projects. Climate change will pose further

challenges in relation to the planning and design of new water projects. For the long-term planning of water resources projects, regional cooperation on basin-wide water management is very important. The Ganges-Brahmaputra-Meghna basins have tremendous agroclimatic diversity, a highly fertile arable land area of about 79 million hectares, a 2 billion ton silt load, an enormous delta spanning Bangladesh and part of West Bengal in India, some 110,000 MW of identified hydropower potential with additional power generation through pump storage capacity, vast navigable waterways, varied forest resources including the largest mangrove forest in the world, a treasure-house of biodiversity, and an abundance of fish resources. There are already conflicts in these transboundary river basins. Potential water conflicts in the Ganges-Brahmaputra-Meghna basins can only be prevented through a holistic approach to the management of existing water resources covering all aspects of water use. Basin-wide harnessing, development, sharing, and management of the common water resources must be carried out within the wider context of a sustainable water resources management programme. The issues concerned can seldom be contained by administrative or economic boundaries. Efforts to tackle them should be broad-based and multidimensional. In an area like the Ganges-Brahmaputra-Meghna basins, where severe imbalances of water availability exist spatially, and also at different times of the year, it is inevitable that any solution to the problem of one water user, will have an adverse impact on another. The issue then becomes one of minimising the impacts. This needs an integrated approach to water resources management with cross-sectoral integration a pre-requisite.

Owing to the seasonal variability of water volume in the Ganges-Brahmaputra-Meghna river systems, the dry season flows of the rivers, particularly of the Ganges, are inadequate to meet the combined needs of the region. This will be further aggravated by climate change. There is an urgent need to augment the flow of the Ganges to overcome water shortages.

Harnessing of the bounty of water during the monsoon season (the rainy season) is essential to meet dry season water needs. This requires the storage of monsoon water flows within a framework of sustainable development in the region. An institutional mechanism for basin-wide river water management, like the Ganges River Basin Organisation (GRBO), in line with the Mekong River Commission (MRC), is very important.

One possible option for substantial augmentation of the Ganges, which could benefit Nepal, India, and Bangladesh, would be to construct large storage sites on the Ganges tributaries originating in Nepal. Due to the potentially high water holding capacity of reservoir sites in Nepal, there are excellent opportunities to create storage reservoirs. In 1983, on the basis of studies, Bangladesh proposed the construction of seven large storage reservoirs at Chisapani, Kaligandaki-1, Kaligandaki-2, Trisulganga, Seti, Saptokosi, and Pancheswar in Nepal. These reservoirs would augment the dry season flow of the Ganges by 1670 cumecs (built at normal height) or 5385 cumecs (with the storage reservoir at Chisapani, Trisulganga, Seti, and Saptokosi built above normal height). Studies indicate that the construction of the proposed storage reservoirs is technically feasible. Moreover, the storage reservoirs would produce enormous amounts of hydro-

electricity, which would meet the power demands of the region. Another beneficial effect of these storage projects would be significant flood mitigation in the downstream Ganges areas. According to studies carried out by the Institute for Integrated Development Studies in Kathmandu, the terrain of the northern and middle belts of Nepal contains excellent sites for storage reservoirs. These studies identified 28 potential reservoir sites – nine of which are classified as ‘large’, having a storage capacity of over three billion cubic metres. A highly favourable project from this perspective is the Saptakoshi High Dam in Nepal, the revived third phase of the original Koshi project. The Koshi Dam will have a significant storage capacity, which should provide both North Bihar (India) and Bangladesh with a flood cushion and augment dry season flows, after meeting Nepal’s full irrigation requirements. It will also provide Bangladesh with an increased additional share of water (of around 50,000 cusec) during the dry season.

Regional cooperation in the Ganges-Brahmaputra-Meghna river basins is very important for integrated water resources management in the basins and adaptation to climate change. Ideally, cooperation based on mutual trust and transparency between the riparian countries should ensure the optimal management and sharing of international rivers. An honest broker is needed to facilitate such regional cooperation. In this respect the Abu Dhabi Dialogue initiated by the World Bank is laudable. The World Bank has established a Knowledge Forum under the Abu Dhabi Dialogue facilitated by ICIMOD. The need to share hydro-meteorological data between countries in the region and for collaborative efforts in relation to flood forecasting and warning and research studies on climate change are equally important.

ICIMOD – a mountain learning and knowledge centre – has been working as a facilitator for regional cooperation for flood disaster mitigation in the Hindu Kush-Himalayan region, as well as conducting research on the impacts of climate change on glacier melt and on downstream consequences. It has also facilitated IPCC panel discussions on global climate change. ICIMOD has contributed significantly to facilitating the exchange of information, knowledge, and expertise among its member countries, thereby enhancing understanding and cooperation among them in addressing sustainable development and disaster mitigation issues. The impact of climate change on mountain ecosystems, the pressure on the natural resource base, threats to the conservation of biological diversity, and continuing social unrest and political tensions within the region, along with increasing discrepancies between the rich and poor, high and low status groups, upstream and downstream populations, are some of the key challenges being faced in the region. Water is the key to overcoming all of these challenges. A study carried out jointly by ICIMOD, UNEP, and the Asia-Pacific Network (APN) for Global Change Research between 1999 and 2003 documented about 15,000 glaciers and 9,000 glacial lakes in Bhutan, Nepal, Pakistan, and selected basins of China and India. Such a high concentration of captive water and ice has aptly earned the Himalayan region the name the ‘Third Pole’. As discussed above, this mountain range feeds most of the major perennial river systems in the region (Ganges, Brahmaputra, Meghna, and Indus, among others) and is considered the lifeline of approximately 10 per cent of the world’s population. Water is the single most important natural resource of the countries that share the Ganges-Brahmaputra-Meghna and will shape the future of millions of people living in the region.

The Creation of ICIMOD and its Expected Role in Addressing Regional Environmental and Developmental Challenges

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As ICIMOD prepares to celebrate its 25th Anniversary in 2008, India, one of its eight regional member countries, set up a Task Force (in May 2008) "for analysing the problems of Hill States and Hill Areas in order to develop a proposal for development of the region". This Task Force constituted by India's Planning Commission has been given a set of six terms of reference to capture and identify the "issues, concerns and problems of hill states and hill areas". The author of this article received an invitation to contribute his suggestions and comments, from the "partner institution of ICIMOD in India", for incorporation in a document purported to be a "broad outline of the draft base paper" for consideration of the aforesaid Task Force.²

These two parallel events – the celebration of ICIMOD's Silver Jubilee and the setting up of a Task Force by India to analyse the problems of hill states and hill areas – provoke the questions: Has ICIMOD rendered itself irrelevant to the HKH region? If not, what role is ICIMOD likely to play in the making and shaping of this Task Force report? Is the Task Force and its report likely to have any significance for ICIMOD, both with regard to ICIMOD's Strategic Framework with regard to its Medium Term Action Plan 2008-12? Is there any coherence between the planning processes of the Indian mountain states and ICIMOD, say for the next five years? Finally, more specifically, does ICIMOD involve itself in similar and related undertakings with, or in, any of its other RMCs, and, if not, why not?

The queries above could as well be asked by any one of the eight regional member countries (RMCs) of this august institution, and the replies that might be offered in each case are arguably going to be specific to the RMC concerned, so geo-politically diverse is the turf that ICIMOD traverses. Even so, in securing answers to one RMC-specific situation, one might hope to see some

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² Letter of Dr LMS Palni to the author on 'Development of a Base Paper on Issues, Concerns and Problems of Hill States and Hill Areas' for the Task Force of Planning Commission, dated 26 May 2008.

light at the end of the tunnel. In this short essay, through a timeline comparison of the various planning processes that have already been completed by ICIMOD and India for its mountain states, an attempt is made to analyse and assess the extent to which it is really possible for ICIMOD to address 'regional' (read Indian) expectations in the realms of environmental and developmental challenges.

India, Indian Mountains and ICIMOD

More synchronised planning is needed.

Taking ICIMOD first, at the macro-level, following the Fourth Quinquennial Review (QQR), the new strategic framework 'Responding to the Challenges of Global Change: Enhancing Resilience and Supporting Adaptation of Mountain Communities' is now in place. The Framework focuses on three strategic programmes: (i) Environmental Change and Ecosystem Services (ECES); (ii) Integrated Water and Hazard Management (IWHM); and (iii) Sustainable Livelihoods and Poverty Reduction (SLPR); supported by a cross-cutting Integrated Knowledge Management approach. The Framework and these Strategic Programmes set ICIMOD's course for the next five years.

The Strategy enlists five strategic goals, which envisage (i) RMCs mainstreaming "ICIMOD's knowledge and technical expertise and their wide use" in their water, ecosystem services, and poverty reduction programmes; (ii) value addition and impacting through "close collaboration with the national partners through long-term regional research" and "scaling up of programmes"; (iii) regional and global utilisation of "ICIMOD's transboundary approach, experience, practices and know-how"; (iv) "benefiting RMC partners through (their) capacity building and knowledge sharing" with what "ICIMOD is (itself) proactively learning and gaining in terms of knowledge and good practices (from whichever source, including the RMCs themselves); and (v) establishment of a "vibrant knowledge management and information sharing network" resulting from ICIMOD's "support in strengthening key RMC institutions to better address water, ecosystem services, and livelihood related issues in the region".

Broken down into strategic outputs, the consolidated MTAP II is guided by the Strategic Framework and is based on the directives of the Board of Governors and the ICIMOD Support Group, and the recommendations of the Fourth QQR (2006). The draft plan has been discussed in national and regional consultations held in all eight ICIMOD member countries, as well as in regional consultations organised at ICIMOD. Among the key recommendations made during the consultations, ICIMOD was expected to (i) scale up its pilot projects; (ii) develop partnerships with centres of excellence; (iii) closely engage with national strategic partners from the planning phase onwards to avoid duplication; (iv) address climate change related impacts, especially expected water shortages and the degradation of environment services; and (v) focus on high value products, their marketing and value addition, and influence value chains. At the end of it all, the MTAP II boils down to "13 strategic outputs and indicators to assess results at the end of five years" (ICIMOD

2007a, 2008). Planning for the next five years was broadly approved by the Programme Advisory Committee plus two special invitees (PAC+) in its 9-12 June 2007 meeting, during which it was suggested that there be "some reworking of the poverty thrust, given its critical importance to the RMCs" and a focus "on meeting the expectations and priorities of the RMCs and international donors" (ICIMOD 2007b).

The Indian Scenario

The Eleventh Five Year Plan of India (hereafter the Eleventh Plan) 2007-12, (with an outlay 120% higher than the Tenth Plan, at INR 3,644,718 crore; US\$ 1= INR 39.25 in Dec. 2005) was approved by the National Development Council on 19 December 2007. ICIMOD's and India's five-year plans both end in 2012, in December and March, respectively. The Indian Plan addresses itself to the challenge of making growth both "faster and more inclusive", and its vision and strategy has been summarised in just two words 'inclusive growth' (Gol 2008a). ICIMOD's Strategic Framework and Medium Term Action Plan II, with its "13 strategic outputs and output indicators to assess results", seem to have no direct bearing on either the Indian development vision and strategy (inclusive growth), or its "27 national or 13 sub-national monitorable targets". Why this disconnect, and how does it impact on rendering ICIMOD and its strategic programmes irrelevant to the mountain regions of India? The preceding analysis has shown that the time-sequencing of ICIMOD's MTAP planning has not factored in the Indian planning timeframe. There is also no evidence in the ICIMOD literature to suggest that it has taken notice of any of its other RMC's timeframes and priorities in relation to their planning processes. How could ICIMOD plan in isolation for the HKH region without taking into account any of the priorities reflected in the planning documents of its constituent RMCs, irrespective of the planning process followed by the individual RMCs? This, in my view, is the basic reason for the 'disconnect', that has been alluded to. It follows that ICIMOD continues to remain more, if not exclusively, sensitive to the planning timeframes and processes of its support-group and donors.

'Misplaced' or 'Missing' Nodality?

Next to this major lacuna is the issue of selecting the right anchor or nodal agency for ICIMOD in its constituent RMCs, an issue which hitherto has not been given any serious thought at all. Out of the eight RMCs, except for the Peoples' Republic of China, the nodality of ICIMOD is anchored in one Ministry or the other, i.e., directly with the Government. The point to ponder, both for ICIMOD and the RMCs, is whether the present nodality is appropriate or is there a need for a change in view of the Strategic Framework of ICIMOD and vis-a-vis the strategy of the RMC concerned? The choice of focus is clearly between 'environment' and 'development' as subjects/themes. For the RMCs, it is not very relevant if it is ministry 'X' or ministry 'Y' that anchors ICIMOD, but for ICIMOD, clearly it makes a world of difference when it comes to the impact of its interventions in the host RMC. ICIMOD's Board of Governors needs immediately to give this issue the serious thought that it deserves. Providing 'the best fit' anchor for ICIMOD in all its RMCs is the best gift the Board of

Governors could give to ICIMOD on its 25th Anniversary, as it is entirely up to them, individually and collectively!

ICIMOD's interventions are clearly going to be directed at the Indian mountain states. Where do we find them in the Indian scheme of things? The Indian plan document admits that India has "learnt how to bring about growth, but we have yet to achieve comparable success in inclusiveness. Poverty, whether we look at it narrowly in terms of the population below the consumption-based poverty line or more broadly in terms of population without access to essential services...our people have a right to expect that the evidently increased economic capabilities of our economy are translated into accelerating progress in these dimensions also." The above demarcates the band-width of 'development' insofar as Indian development interventions and planned resources for the realisation of development goals are concerned.

The Eleventh Plan is geared to build on the achievements of the Tenth Plan, which was a period of "extensive review of environmental processes and law", by integrating "environmental considerations into policy making in all sectors of the economy – infrastructure, transport, water supply, sanitation, industry, agriculture, and anti-poverty programmes". Initiatives short-listed by the Indian planners to integrate environmental concerns into planning and development activities include (i) "making environment a concurrent subject in the Indian Constitution (presently it is a residual subject), since regulation and enforcement in this area cannot be handled by the Central Government alone and the responsibility of maintaining the environment rests at all levels of government"; (ii) "setting up an independent statutory body on sustainable development with the specific responsibility of guiding government policies and programmes for making them more socially and environmentally sustainable, and to monitor and evaluate their outcomes"; (iii) "restructuring of State Pollution Control Boards into statutory Environment Protection Authorities with the mandate of developing regulations, standards and upgraded facilities for enforcing compliance" and such similar issues.

Has ICIMOD's strategic programme ECES taken note of these requirements of India and could these be covered by the strategic outputs and indicators listed for ECES in the MTAP II? If the answer to some of these questions is affirmative, then ICIMOD is certainly 'in business' (Government of India 2008b). It is only through proactively serving such identified demands of the RMCs that ICIMOD can demonstrate that it is now ready to do ground breaking work. Besides a considerable amount of ground breaking work, an equally sizeable number of door-opening assignments appear overdue, a legacy of 'misplaced' anchoring of ICIMOD within RMCs. No wonder the last QQR panel found itself repeatedly having to open doors on behalf of ICIMOD! These are the tests that the new Framework is now required to pass, and these are the themes for which ICIMOD must bring on board its strategic and cooperation partners in India.

Given the bandwidths of 'development' and 'environment and climate change', one wonders if ICIMOD's present nodality anchored in the Ministry of Environment and Forests is appropriate, as

the major thrust of the Indian Plan is going to be 'inclusive growth' and not the environment? Is this simply a case of 'misplaced' nodality or that of a 'missing' one, in so far as its mountain states are concerned? This is the third major issue that needs to be examined at this important juncture.

Bridging Regional Imbalances

The objective of India's Eleventh Plan, as stated, is "faster and more inclusive growth", and each of the 13 chapters in the Eleventh Plan deals with what the Plan proposes to do to achieve this dual objective. The Plan acknowledges "widening income differentials between more developed and relatively poorer States" as a matter of serious concern. In this segment of the Plan, the 11 Indian mountain states (all Special Category States) are compared, both against each other and against the other 17 Non-Special Category States, in terms of progress in growth rates measured by State Domestic Product over the term of the past three Plans. The Plan seeks to target the slower growing States, and the backward areas within these States, for higher levels of public investment to enable discrepancies in physical and social infrastructure to be addressed.

From the point of view of the Indian mountain states, the second segment, related to the North Eastern Region (NER) of the country which is an area of low per capita income and major growth requirements, holds greater significance. The NER offers itself as an excellent case study for ICIMOD. Besides recognising the eight North Eastern States as Special Category States, a slew of measures have been taken for their development covering (i) policy changes as "new initiatives for the North Eastern Region" (e.g., "earmarking 10% of the Plan budgets of the central ministries/departments for development of NER"); (ii) "Non-Lapsable Central Pool of Resources (NLPCR)"; (iii) "setting up of Ministry of Development for North Eastern Region" in 2001 "to coordinate and give impetus to the Centre's development efforts"; (iv) "transfer of NLPCR to the Ministry of Development of North Eastern Region (DoNER) from the Planning Commission"; and (v) "establishment of a North Eastern Council to act as an advisory body in respect of socio-economic development and balanced development of the eight states", among other measures (Government of India 2008c).

Ministry of Mountain Development

Just as in the NER, the mountain states "though rich in development potential in terms of human capital and natural resources, lack adequate physical infrastructure" impeding their growth. In other mountain states of India also "the primary sector has remained largely stagnant, the secondary has been handicapped due to a variety of reasons" and "the planning exercise has resulted mainly in the expansion of the tertiary sector". Is this not the universal experience all over the HKH? If so, then the NER case study needs to be taken up by ICIMOD and ICIMOD ought to assess for itself the extent to which its three strategic programmes and 13 strategic outputs and indicators are relevant to the eight NER mountain states. The degree of coherence between its 13 strategic outputs and the priorities of the NER is a clear indicator of ICIMOD's relevance to the NER mountain states of India.

Given its unique role in the overall development of as many as eight mountain states out of a total of 11, the Ministry of DoNER appears to be a more appropriate host/anchor for ICIMOD in place of the MoEF, as the latter seems less qualified to mainstream 'inclusive growth' in the backward mountain states of India. The Ministry of Development of North Eastern Region could be upgraded to a Ministry of Mountain Development by simply adding the three remaining Indian mountain states of Uttarakhand, Himachal Pradesh, and Jammu and Kashmir, without incurring any additional expenditure, as these remaining states are also 'Special Category States' and, like the NER states, enjoy the benefit of the 'special industrial incentive package'. The policy changes that have been tried and tested successfully in the NER mountain states could be selectively and gradually applied to the remaining three mountain states, and, in turn, the NER states could also benefit from the experiences and best practices of the other states.

This, incidentally, is one of the major recommendations of the Task Force on the Mountain Ecosystems for the Environment and Forest Sector, constituted by the Planning Commission for the Eleventh Five Year Plan. In addition to establishing a Ministry of Mountain Development, this Task Force suggested (i) "mainstreaming of FRDC types of administrative structures"; (ii) "back-stopping of Ministry of Mountain Development by R&D institutions located in the Indian Himalayan Region (IHR) region"; (iii) "following Indian Council of Agricultural Research (ICAR) Regional Committee system for identifying R&D issues of States"; and (iv) "effective addressing of mountain poverty", among other things (Government of India 2006). These recommendations deserve examination by, and the support of, ICIMOD.

With the global importance of mountains being increasingly recognised, a study of the mountain areas of the 15 countries of the European Union (EU), the 10 acceding countries, and the 2 accession countries of Norway and Switzerland has also arrived at the same conclusion: that there exists an urgent need "to recognise the great diversity that characterises these areas, at all scales. Natural, economic, and social handicaps exist, but not everywhere or to the same extent." The study points out that "in the context of globalisation, mountain areas face three contradicting challenges: to turn into 'open museums' or areas for recreation and protected nature for industrialised societies; to be regarded as regions to be economically exploited; or even to be over-exploited; and abandoned."

This study, while recognising "the European dimension of mountain regions and expectations from mountain actors", found "the need for an EU policy specifically directed to the mountain areas and distinct from other structural policies...not unequivocal". The study observes that structural problems could generally be addressed through the classical objectives of regional policies and through the programming approach of the Structural Funds. Its most important conclusion is that "co-ordinated mountain policies would involve a large number of different sectors, and therefore remain a national responsibility. Any future EU mountain policy must respect the principle of subsidiarity. Given the great variety in national approaches to mountain issues, there will be much to gain from international comparative studies of the implementation of policies and measures and systematic

dissemination of experiences between regions and countries" (EU 2004). ICIMOD would do well to share the diverse set of experiences in the implementation of policies and measures of its constituent RMCs, in the first instance by securing better insights into them, which would only be possible through an appropriate nodality/anchor in each RMC, and not through sectoral Ministries, as is the case at present.

Such a gigantic task is obviously beyond a single ministry responsible for one sector, as is the case in India with the MoEF. The task should be entrusted to a ministry that can effectively coordinate the functioning of a large number of different sectors in the spirit of 'national responsibility'. This underscores the necessity for a Ministry of Mountain Development to effectively coordinate the work of the various sectors and the Indian mountain states. Such a Ministry would obviously be the nodal Ministry for ICIMOD, for various institutions handling sectoral policies having a bearing on mountain regions, and for all the Indian mountain states. The development of mountains has to be a national responsibility, as the European study has clearly emphasised. The sooner that this is realised, the better it will be for a country like India with such a large mountainous area. The sectoral approach to mountain development must be abandoned immediately and an integrated approach embraced.

RMC 'Immersion' of ICIMOD

The Fourth QQR emphasised 'regional ownership'. The Programme Advisory Committee plus (PAC+), while supporting ICIMOD's new Strategic Framework, again emphasised that it should give ICIMOD "a strategic chance to do groundbreaking work" in a number of areas and, in particular, "to focus on meeting the expectations and priorities of the RMCs". Therefore, the following are suggested:

- Along the lines of what has been undertaken briefly with reference to one of the RMCs (India) above, a similar exercise could be commenced quickly with regard to the medium-term plans of the remaining seven RMCs (as most of them undertake central planning exercises similar to that undertaken by India). What would emerge, is likely to be not only more 'RMC-needed' but also 'RMC-supported and financed', enabling ICIMOD to take its first steps towards becoming 'RMC-owned' in real terms.
- The outcomes of this exercise should be harmonised with ICIMOD's 13 strategic outputs and output indicators in MTAP II, abandoning those that do not pass muster on this 'RMC-test' as it were.
- ICIMOD should closely examine the present nodal institution in each RMC and negotiate the anchoring of ICIMOD in an institution/set-up that addresses the largest number of development indicators in the RMC strategy for the mountain regions of that country in the medium term. Having an appropriate nodality for ICIMOD in the RMCs is far more valuable than the monetary contributions that the RMCs make individually or collectively.

This exercise would address some of the key issues raised by the last QQR Panel such as “understanding of priorities and policies of RMCs”, “a regional approach in contrast to a one-to-one interaction”, “non-harnessing of RMC funds”, “long term financial sustainability”, and “weak regional ownership”. Here, it would be worth recalling the concluding remarks of the Fourth QQR Panel:

“Continuing and improving on the existing strengths will not be sufficient for ICIMOD’s future development. The need to change is recommended not just for the sake of sustainability but because it is rather considered a question of institutional survival. ICIMOD has to become more meaningful otherwise the donors will discontinue funding and the RMCs will not adopt the institution” (ICIMOD 2006).

In Conclusion: Back to GBPHIED

As the task of developing a draft of the base paper on ‘Issues, Concerns and Problems of Hill States and Hill Areas’ has been entrusted to the G.B. Pant Institute of Himalayan Environment & Development (GBPHIED), which is presently the nodal institution for ICIMOD in India, it is naturally expected that this base paper would not only substantially reflect what ICIMOD has on offer for the Indian mountain states on its 25th Anniversary, but also serve as ‘documentary evidence’ of the fact that ICIMOD has finally come of age and is today recognised by the Indian Planning Commission and the Indian mountain states as a unique regional intergovernmental organisation dedicated to the “improvement of the environmental conditions of the HKH region and livelihoods of poor mountain people”. It is only through the evidence of such official RMC documents that the credibility of ICIMOD’s claims of ‘impacting’ and ‘scaling up’ can be validated and become acceptable to its various stakeholders, especially those who are destined to inhabit the HKH mountains.

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Linking Mountain Communities and Ecosystem Services: Options for Sustainable Livelihoods

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Introduction

At the beginning of the 21st Century, humanity faces two daunting challenges. One is to meet the ever-increasing threat posed by a changing climate, and the other is to lift an estimated three billion people out of poverty. Both these challenges are magnified for mountain regions. First, it has been predicted that the impacts of climate change will be felt at a much greater scale in Asia and Sub-Saharan Africa. Confirming this, the Himalayan region has experienced much greater warming rates than the global average of 0.74°C during the last 100 years (Eriksson and Jianchu 2008). This leaves little doubt that the impacts of climate change will manifest more seriously in mountain regions. Second, more than half the world's population that live in poverty are found in Asia. A significant proportion of this population lives in mountain regions. These populations will bear the brunt of the negative effects of climate change.

Globally, mountains occupy more than 20% of the Earth's land surface and provide more than 80% of our freshwater (The Mountain Institute 2006). Mountain regions also account for some of the most diverse ecosystems. However, by any account, mountain communities are some of the world's most deprived. Mostly rural, and subsisting on small-scale farming, these communities are heavily dependent on natural resources and, therefore, at greater risk from the effects of climate change and degrading ecosystems.

The Hindu Kush-Himalayan (HKH) region is home to an estimated 200 million people. A significant portion of these people live in poverty, and their dependence on an increasingly fragile and vulnerable resource base highlights the need for renewed efforts to conserve these fragile ecosystems and build resilient mountain communities. We have to acknowledge that these communities have been the stewards of our mountains and have thereby ensured the sustained flow of ecosystem services.

Models and institutional mechanisms that can benefit such communities through the receipt of payments for stewardship of environmental services must be tested and promoted. This paper is

written on the premise that good environmental stewardship should be promoted and encouraged. Recognising the opportunity costs borne by mountain communities, it is asserted that compensation should be made for such stewardship. Furthermore, it is believed that such compensation has the potential to engender resilient communities, which will ultimately lead to sustainable livelihoods. To this end, it is purported that there is value in adapting useful lessons learned in other parts of the globe for use in our region.

This paper is primarily drawn from personal experiences in the region in general, and our own country, Bhutan, in particular. Where relevant, we refer to experiences from other regions and countries. Having had the opportunity to visit a number of mountainous areas in ICIMOD's eight member countries, and the rare opportunity to interact closely with local communities, I feel that most of the issues covered in this paper are relevant across the HKH region. Bhutan is a fully mountainous country and its approach to managing natural resources and promoting sustainable livelihood options for its people would be applicable to other mountainous states and provinces in the region. It is my intention to present an honest account of what can be done given the limitations of geographic fragility and political instability that permeate the region, as opposed to what could be done under ideal circumstances. Note, however, that this paper is in no way to be treated as an academic manuscript.

Mountain Ecosystem Services

Water for life

That mountain landscapes are reservoirs and provide water for drinking, irrigation, and many of mankind's other industries is often overlooked. Globally, it is estimated that more than 80% of freshwater comes from mountains (The Mountain Institute 2006). Within the HKH region, the mountains and the rivers they sustain provide the livelihoods for an estimated 200 million people. More importantly, the basins of these rivers provide water for almost a fifth of the world's population, about 1.3 billion people.

Changes associated with climate change will impact on these rivers and their basins, affecting the people who depend on these rivers, and their livelihoods. Growing evidence points to changes in the pattern of river flow volumes. For the HKH region, high-level discharges used to last from April to September. Now, more intense runoff is being experienced for shorter periods in April and May (Eriksson and Jianchu 2008).

The implications of such a change and the kind of negative impact it will have on almost 1.3 billion people are unfathomable. What was so generously provided for and regulated by our mountain landscapes is under threat. At a regional level, proper management of watersheds will help buffer such impacts. However, global climate change needs concerted action at a global level.

Water for energy

Run-of-the-river hydropower plants have become the economic mainstay of many developing mountain nations. More than anywhere else, Bhutan's economy relies on hydropower. It is estimated that there is a potential for 21,000 MW of hydropower generation in Bhutan (Quader 2004). Current estimates put the GDP generated by hydropower at 14%, with revenue earnings from the sector totalling Nu. 4595.5 million (NSB 2007). By 2020, this is expected to reach Nu. 20 billion per annum. At an exchange rate of Nu. 42 to US\$1, this would generate US\$ 5 billion for Bhutan per annum.

While the revenue generated is substantial, the investment required is also huge. Given this, the Royal Government recognises the need to conserve watersheds to increase the viability of such hydropower schemes.

The changing water flow regimes described earlier also carry a warning for hydropower plants. Increased sedimentation loads and variable and unpredictable water flow regimes mean higher vulnerability for the power plants. These factors could also lower the potential lifespan and power generating capacity of such plants.

Carbon sinks

It is becoming increasingly clear that forests are important carbon sinks. Loss of forests has been linked to increased carbon loads in the atmosphere. Agreed estimates pitch the contribution of deforestation to climate change at about 19%. This is greater than the contribution of the entire global transport sector (www.panda.org). Across the globe, deforestation is a continuing challenge. Within the HKH region, in some countries, poverty and other associated factors have led to massive loss of forest areas.

In Bhutan, with an estimated 64% under tree cover and an additional 4% under vegetative cover, we have been quite fortunate. Enlightened leadership, strong legislation, and effective implementation have resulted in this. All forest areas are managed under the stringent and binding Forest Management Code of Bhutan. Legal instruments ensure that it is abided by. Additionally, about 48% of our country is under a network of protected areas. This is perhaps the highest for any country.

Biodiversity

Mountain ecosystems harbour some of the most charismatic species on the planet and are known for exceptionally high levels of biological diversity. The eastern Himalayas are considered to be one of the 10 biodiversity hotspots in the world. In addition to its intrinsic value, biological diversity holds great value for bio-prospectors. Often unmentioned is the fact that it is the tapestry which holds ecosystems together.

Recreation

Mountains have the ability to inspire. The sheer majesty, strength, and mystery of mountains is a call to the human soul. In this sense, mountains have a special relationship to that part of human nature that seeks for adventure, wellness, and spirituality. It is, therefore, not surprising that an estimated 2 billion people consider mountains sacred (The Mountain Institute 2006).

The global market related to tourism was estimated at US\$856 billion in 2007 (www.unwto.org). The market share of nature-based tourism is on the increase. The HKH region is home to some of the highest mountains on this planet. In addition to many unique floral and faunal species, these mountains are also home to some of the most endangered cultures on our planet, and, as such, hold immense potential for tourism.

Options for Sustainable Livelihoods through Payment for Ecosystem Services

The links between mountain resources and sustainable livelihoods are intricate and tightly knit. As already mentioned, almost 1.3 billion people rely in some way on the mountain resources in the HKH region. In Bhutan, an estimated 78% of the population are rural dwellers and depend extensively on mountain resources to sustain their livelihoods.

Water for energy: Harnessing the bounty of the world's tallest water towers

Hydropower is considered one of the most environmentally friendly forms of energy. Given the rugged landscape and steep altitudinal gradients, many rivers in the HKH region hold the potential to generate substantial amounts of clean energy. Bhutan has been trying to tap its hydroelectric potential through bilateral collaboration with the neighbouring country India for mutual benefit. Several joint initiatives have taken place to generate hydropower. The Government's 2006 Revenue Report reflects that in 2006 the Chukha Hydroelectricity Plant earned Nu. 2093 million. In Bhutan, an estimated 6500 MW will be generated by the year 2020. Most of this will be exported to India, generating substantial revenue (estimated at US\$5 billion/annum by 2020).

In the face of increasing risks due to global warming, the need to ensure the viability of such hydropower schemes is recognised as a concern. At the national level, this is being enforced through the mandatory protection of forest catchments areas and the huge network of protected areas. Within all such protected areas, resource use is limited to selected felling of timber for personal use with minimal extraction of non-timber forest products. No commercial harvesting of timber is allowed.

Even in forests outside protected areas, clear felling is not allowed. This very strong focus on the conservation of forests entails an opportunity cost for our people, who are not allowed to exact economic benefits through the utilisation of forests.

In Bhutan, the Government has recognised that communities are foregoing short-term benefits. In an effort to address and compensate for such opportunity costs, the Government has recently decided to plough back 1% of the revenue generated from hydropower projects into the Department of Forests. At current estimates, this fund amounts to Nu. 5 million/annum (equivalent to US\$120,000/annum). These funds will be used to manage critical watersheds and to improve the livelihoods of communities within watershed areas.

Another option would be to use this money to increase the endowment of the Bhutan Trust Fund for Environmental Conservation. This trust fund, which was set up with the help of the Global Environmental Facility (GEF) and WWF, is financing most conservation works in Bhutan.

Water for drinking and household use

Given the dependence of almost 1.3 billion people on mountains within the HKH region for their water needs, it is crucial that good upstream habitat management be accorded priority. To ensure habitat integrity, it is essential that upstream communities be adequately rewarded for the stewardship of important habitats. Inspiration can be drawn from the experience of Columbia where downstream communities volunteered to compensate upstream communities for habitat protection to ensure proper drinking water (Forest Trends/ the Katoomba Group/ UNEP 2008).

Figure 1: **Tala dam, constructed as a joint initiative between India and Bhutan** (*Karma Dupchu*)



Water for agriculture and industry

Agriculture is the mainstay of a significant proportion of people within the HKH region. A significant proportion of all agriculture within the HKH is irrigated by the rivers. With an ever growing economy, especially in China and India, there is a growing need for water for manufacturing and other industries.

The growing economies of the HKH countries will stretch the capacity of our water resources. Upstream habitat management will be crucial to ensure the continuing adequate supply of water. Finding and establishing mechanisms to compensate communities and institutions responsible for habitat management will be crucial to sustain such stewardship.

Forests as carbon sinks

The global carbon market stands at an estimated US\$64 billion (Hamilton et al. 2008). Areas under sustainable forest management and protected areas are substantial within the HKH region. Policies favouring such sustainable use of resources should be encouraged. In addition to state managed forest resources, most countries within the HKH region are increasingly promoting community managed forests. However, deforestation still remains a major concern in some of the countries in the region.

In Bhutan, we intend to establish a community forest for every village over the next five years. As of now, we have already registered 91 community forests with an average size of about 120 ha. An estimated 10% of all such forests are degraded and need to be planted. Such areas where replanting will be carried out can be traded on the international carbon market.

International markets and institutions should be encouraged and coaxed into contributing substantially to reward and promote the conservation and sustainable utilisation of forest resources within mountain regions. Recently, it is encouraging to note, the Government of Norway committed itself to providing US\$100 million over the next five years to Tanzania to reduce deforestation and thereby offset carbon emissions (www.katoombagroup.org).

Income from the sustainable utilisation of forests

Sustainably managed forests will benefit mountain communities immensely, not only by meeting timber and non-timber needs, but also by increasing incomes through the sale of carbon and other environmental services. In Bhutan, we currently operate 16 large forest management units and 5 smaller ones, covering a total area of 156,578 ha. We are proposing to pump back a portion of the revenue from such areas to communities in the units as a reward for protecting the environment.

As mentioned earlier, we intend to establish a community forest for each village within the next five years. These communities will earn additional income from the sale of produce and services from sustainably managed forests. Where communities forego the right to harvest produce, mechanisms will be sought to compensate them for their stewardship.

Such models that ensure direct benefits to mountain communities should be promoted and vigorously pursued within the HKH region.

Banking on biodiversity: Sustainable and alternative ways of utilisation

The HKH region is one of the most biologically diverse on the planet. Within the Himalayas itself, it has been estimated that more than 700 plants have medicinal value. Carried out under an effective framework of legislation and institutions, the proper harvesting and marketing of such plants has immense potential to benefit mountain communities.

One such plant is the cordyceps (*Cordyceps sinensis*). This grows almost throughout the Himalayas. In Bhutan this year (2008), the total revenue earned by farmers amounted to Nu. 96 million (US\$2.3 million). This huge influx of revenue is changing our communities in profound ways. The challenge is to convince local communities to invest such increase in income in sustainable projects.

Another valuable resource is mushrooms. Our mountains are home to a diverse array of mushrooms. Amongst them matsutake, which is the most highly priced, is found in most regions in the HKH.

Like elsewhere, even in Bhutan, we are already facing problems associated with decreasing harvests and degraded habitats. In addition to promoting sustainable harvests, one way of supplementing incomes is through tourism. This year, we launched the first ever Matsutake Festival in Bhutan. This was held with the aim of 1) making people understand how precious resources such as the matsutake are, and thereby making them aware of the need to adopt sustainable harvesting methods; and 2) to supplement the incomes of rural communities who have firsthand knowledge about such mushrooms and their habitats.

In the face of continuing challenges associated with the need to simultaneously raise incomes and conserve habitats, such innovative models of resource management will have to be increasingly tested and adopted. Local knowledge and local institutions should be strengthened and empowered to implement such programmes.

Tourism

The total global tourism market is valued at US\$856 billion. This is significant. Given the uniqueness of the HKH region in terms of both nature and culture, tourism offers great potential to generate extra revenue for our local communities. Under a scenario where incomes are raised

through such tourism schemes, local communities will become keener to conserve forests and mountain ecosystems.

Home to some of the highest mountains, most rugged rivers, and highest trekking routes on Earth, tourism within the HKH offers tremendous potential to uplift the livelihoods of local people. However, lessons from the past have shown that mass tourism does not necessarily benefit rural communities. Instead, most of the time, the negative impacts associated with such an industry leave us poorer spiritually and culturally. This reminds us again of the need for effective policies and monitoring tools.

However, in an increasingly globalising world, where places and cultures – including biodiversity – are getting more and more homogenised, the HKH stands as a unique cultural and spiritual icon. This uniqueness must be tapped. Better marketing, institutional arrangements, and policies should aim to ensure that the benefits from tourism significantly improve the livelihoods of mountain communities who are the true guardians of our sacred heritage.

Payment for ecosystem services

At the moment, there are hardly any examples of payments for ecosystem services within the HKH region. So far, we have taken the bounties and services provided by our fragile mountain ecosystems for granted. And, so far, we have not had to face any serious implications. However, under a rapidly warming climate, the need to buffer the impacts of climate change by the proper management of ecosystems at the local level and by committing the global community to tackle this issue is urgent.

There is a need to seek a global consensus and initiate concerted global action against global warming and other threats to ecosystem services. At the regional and local level, the proper management of ecosystems is crucial. To ensure this, payment to communities for the proper stewardship of our ecosystems should increasingly be one of the bases upon which options for sustainable livelihoods are discussed.

ICIMOD's role

So far, ICIMOD's contribution to the HKH region has been substantial in terms of generating information and serving as a knowledge bank. It has been successful in bringing the mountain agenda to the forefront. Additionally, it has been able to effectively leverage governments on issues of common concern.

In light of the two present challenges of climate change and poverty, ICIMOD needs to build and recommend strategies based on shared experiences. Given that payments for environmental

services have been shown to benefit and contribute towards better stewardship of ecosystems, models for implementing this should be piloted. However, the contribution of such schemes to reducing poverty levels and building resilient communities remains dubious. Cross country research and knowledge generation on this theme should be given priority.

International donor contributions should be sourced for this important endeavour. ICIMOD should use its unique position to influence member country governments to proactively support this effort. Lessons learned through research and pilot implementation programmes should be translated into policy options for governments to follow up on.

Conclusions

In a fast changing and evermore industrialised world, it is easy to forget that humanity's future depends on the ability of our ecosystems to provide their services. These services, which range from helping to regulate the climate to purifying our air and providing us with clean water, are diminishing at an alarming rate. Conservation of this natural capital (Turner and Daily 2008) is critical for ensuring sustainable livelihoods.

Across the globe, issues such as the need to maintain current levels of ecosystem services, which lie at the very heart of humanity's ability to survive and thrive, are often forgotten. Most times, other pressing concerns such as war and terrorism take centre stage. However, the roots of most conflict can be traced back to diminishing natural capital, which leads to a reduction in the resilience of communities to provide for basic needs such as food, water, energy, and shelter.

In our region of the HKH, while we are united by geography and thereby face common problems and issues, the political landscape is strikingly different across countries. Terrorism and political instability in some countries threaten our ability to thrive and prosper. To this end, we must find a new consensus in our political ideology. New leaders with vision must forge a stronger path with the common good at the forefront. At a time when the world has to rise up against threats related to global warming and widespread poverty, there is no time to lose. Paying for environmental stewardship and building sustainable livelihoods is a small, yet significant, step towards building a better world and a better future.

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Annexes

Annex 1: About the Contributors

Dr Zafar Altaf, a national of Pakistan, is a renowned economist and former Secretary of the Ministry of Food, Agriculture and Livestock, Government of Pakistan. As a member of the Civil Service of Pakistan, he served in different capacities including Member of the Planning Commission; and Chairman of the Pakistan Agricultural Research Council. He has served as a Member and Chair of the Board of Governors of several international organisations including ICIMOD and the International Irrigation Management Institute (IIMI), and as Vice Chair of the IFAD Council.

Dr Pema Gyamtsho is Honb'le Minister of Agriculture in the cabinet of the Royal Government of Bhutan. Besides his impressive political career, Dr Gyamtsho is a scientist and development practitioner with considerable experience of working in government in different capacities and in international organisations like ICIMOD and Helvetas. He has authored several books and articles.

Dr Narpat Singh Jodha, an Indian national, is well known for developing the Mountain Perspective Framework. He has worked in several different organisations including the World Bank, FAO, UNEP, and ICIMOD. Dr Jodha has written several books and published more than 80 papers. He is a Fellow of the World Academy of Art and Science and President of the Indian Society of Agricultural Economics and has been President of the International Association for the Study of Commons and the Indian Society of Ecological Economics.

Dr Madhav Bahadur Karki, a Nepali national, is Deputy Director General-Programmes of ICIMOD. Prior to joining ICIMOD, Dr Karki worked for ten years in IDRC Canada's regional office in New Delhi as Senior Programme Officer. Dr Karki taught at the Institute of Forestry, Pokhara, for 13 years where he served as the Acting Dean, Campus Chief, Assistant Dean, and Director of Research of the Institute. In IDRC, Dr Karki established the Medicinal Plants Programme in Asia (MAPPA) which is now housed at ICIMOD. He has authored several books and journal articles.

Dr Klaus J Lampe, a German national, is a development practitioner and scientist. He is one of the people who conceived the idea of establishing a mountain centre in the Himalayan region in the early 1970s. He served for many years as Director of Agriculture and Rural Development of GTZ. Dr Lampe was a Founding Member of the ICIMOD Board of Governors and is former Director General of the International Rice Research Institute.

Professor Bruno Messerli, a Swiss national, is Emeritus Professor of the Geographical Institute, University of Berne, Switzerland. Professor Messerli is a geographer and scientist, and played a leading role in establishing the Mountain Chapter of the United Nations' Agenda 21. Professor Messerli's numerous publications, scientific papers, and books are proof of his continuous

endeavours to give geographical research enhanced socio-political relevance. He is Vice Chair of the ICIMOD Board of Governors and Chair of the Programme Advisory Committee. Professor Messerli is a Fellow of the World Academy of Art and Science.

Mr Aspi D Moddie is an Indian national and former Indian Administrative Service (IAS) officer. He is a mountain lover and has been very involved in raising awareness of the need to conserve the Himalayan environment, and in the Himalayan Club. Mr Moddie is one of the people who perceived the idea of establishing a mountain centre in the Himalayas. His book 'Voices in the Wind' described the detailed journey of ICIMOD's establishment.

Mr Nawang Norbu, a Bhutanese national, is working in the Ministry of Agriculture, Royal Government of Bhutan. Mr Norbu is a forester by training and specialised in nature conservation.

Professor Ouyang Hua, a national of China, is Senior Research Scientist and Professor of Graduate University at the Institute of Geographical Sciences and Natural Resources Research (IGSNRR), under the Chinese Academy of Sciences. His research areas include climate change, ecosystems, carbon cycling, and natural resources management and he has published over 80 papers. He recently joined ICIMOD as Programme Manager.

Ms Reba Paul, a national of Bangladesh, is Executive Secretary of the Global Water Partnership Bangladesh. She is a water specialist and actively involved in promoting integrated water management.

Dr Andreas Schild, a Swiss national, is the Director General of ICIMOD. Dr Schild is a development specialist with more than 30 years of experience in designing, planning, implementing and monitoring development programmes in various development areas including natural resource management. He has worked in many parts of the world including Asia, and has served among others as a Country Director of Swiss Development Cooperation in Nepal and Rwanda/Burundi, Executive Director of Intercooperation, Chief Technical Adviser in North Korea for UNDP, and most recently as Team Leader of the Oversight Consultant of the National Solidarity Programme in Afghanistan. Dr Schild was recently awarded the Sir Edmund Hillary Himalayan Environment Award by the Himalayan Environment Trust.

Mr Quamrul Islam Siddique, a national of Bangladesh, was Secretary, Government of Bangladesh, and Chairman, Bangladesh Water Partnership. Mr Siddique was well known for his contributions to rural infrastructure development in Bangladesh and was the founder of the Local Government and Engineering Department. Mr Siddique passed away unexpectedly on 1 September 2008. He was a true friend of ICIMOD and his contribution will be remembered by all of us.

Professor SP Singh, an Indian national, is a member of the Indian National Science Academy and former Vice Chancellor, HNB Garhwal University, Srinagar (Garhwal), Uttarakhand, India.

Professor Singh is a renowned scientist and educationist with a high record of publication in the field of ecology. He has served as a member of many national committees and been involved in development and social work.

Professor Sun Honglie, a national of China, is an Academician and former Vice-President of the Chinese Academy of Sciences. Professor Honglie, is a renowned scientist and leader of the Tibetan Plateau scientific survey, and has contributed greatly to Tibetan Plateau research. He has published widely. Professor Honglie has served as a Member of the ICIMOD Board of Governors and as Board Chair.

Dr MS Swaminathan, an Indian national, is a renowned agricultural scientist, known world-wide for his contribution to the Green Revolution in Asia. He was awarded the Ramon Magsaysay Award for Community Leadership in 1971, chaired the UN World Food Congress in Rome in 1974, and received the World Food Prize in 1987. Currently, Professor Swaminathan is Chair of the MS Swaminathan Research Foundation and a Member of Parliament (Rajya Sabha) of the Tamil Nadu State of India.

Dr RS Tolia, an Indian national, is Chief Information Commissioner of Uttarakhand, India. He was a member of the Indian Administrative Service (IAS) and served in the Government of India for 35 years in different capacities including as Chief Secretary, Government of Uttarakhand, Principal Secretary and Forest and Rural Development Commissioner in Uttarakhand, Director of UP Academy of Administration, and other senior positions. He is the author of several books and journal articles. He served as a member of the Independent Review Mission of ICIMOD in 2006.

Dr Ram Prakash Yadav, a Nepali national, is Vice Chair of the Poverty Alleviation Fund Nepal, and a renowned scientist and development practitioner. He has served in both government, including as Member of the National Planning Commission, and in international organisations including the International Food Policy Research Institute and ICIMOD, where he was the first Deputy Director. He has authored several books and articles.

Regional Members of the ICIMOD Board of Governors

Eng Ghulam Mostafa Jawad is Honb'le Deputy Minister, Ministry of Agriculture, Irrigation and Livestock, Government of Afghanistan. Eng Jawad graduated in Agriculture from Kabul University and has had a long political career with much experience in development. He has worked in the Ministry of Agriculture for more than two decades and was acting Minister of Agriculture for some years. He contributed significantly in the peace building process.

Mr Shaikh Altaf Ali is Secretary, Ministry of Chittagong Hill Tracts Affairs, Government of Bangladesh. Mr Ali is a career civil servant and has held many senior positions in the government including Secretary, Ministry of Civil Aviation and Tourism; Member (in charge) Planning Commission; and Additional Secretary, Ministry of Information; and has been involved in national policy formulation and implementation.

Mr Sherub Gyaltsen is Secretary, Ministry of Agriculture, Royal Government of Bhutan. Mr Gyaltsen started his career in the Bhutanese civil service in 1978 and since then has served in many important positions including Director General in the Department of Agriculture, and Director of Research and Extension.

Professor Ding Zhongli is an Academician and Vice President of the Chinese Academy of Sciences, China. He was elected as a member of the Standing Committee of the National People's Congress of China in March 2008. Professor Ding's research focused on Quaternary climate change. His research findings have been published in numerous international journals and are widely cited.

Mr Vijai Sharma is Secretary, Ministry of Environment and Forests, Government of India. Mr Sharma joined the Indian Administrative Service (IAS) in 1974. In his long professional career, he has served in many senior positions and has been involved in national policy formulation and implementation. Before joining the Ministry of Environment and Forests, Mr Sharma was the Special Secretary, Cabinet Secretariat, Government of India.

Professor Kyaw Htun is Deputy Director of Planning and Statistics of the Ministry of Forestry of the Government of the Union of Myanmar. Professor Htun has served for more than 30 years in the Government of Myanmar in different capacities including Professor at the University of Forestry, and Head of the ASEAN and International Relations Unit of the Forest Department.

Professor Pitambar Sharma is Vice Chairman of the National Planning Commission, Government of Nepal. Professor Sharma is a geographer by training and specialised in regional planning, rural development, and tourism. He started his career as a lecturer at Tribhuvan University in Nepal and has several publications to his credit on regional planning, sustainable development, sustainable tourism in mountain areas, and market towns and area development, among others. Professor Sharma is an ICIMOD alumni having worked at the Centre for more than a decade during the 1990s in various capacities including as Head of the Mountain Enterprises and Infrastructure Division.

Mr Muhammad Zia-ur-Rehman is Secretary, Ministry of Food, Agriculture and Livestock, of the Government of Pakistan. Mr Zia-ur-Rehman joined the Pakistan Civil Service in 1976, and has since served in different capacities and held many important positions including Secretary, Ports and Shipping Division; Secretary, Planning and Development Division; and Secretary to the Governor of Punjab.

Annex 2: Key Events and Milestones in ICIMOD's Growth and Development

1981	An agreement is signed by the Government of Nepal and UNESCO, which provides the legal basis for establishment of the International Centre for Integrated Mountain Development (ICIMOD)
1982/1983	Logistics, organisational structure, and professional contacts within the region and outside are developed, a draft work programme for the Centre finalised, and the first Director selected.
Aug 1983	First Board of Governors meeting held.
1-5 Dec 1983	First International Symposium on 'Mountain Development 2000: Challenges and Opportunities' is held together with the Inauguration of the Centre.
28 Mar 1984	Professor Kenneth Colin Rosser, the first Director of ICIMOD, takes up his post.
May 1984	ICIMOD's Phase I Work Programme begins with the recruitment of professional staff drawn from the region to undertake state of the art reviews in the areas of watershed management, rural energy, and off-farm employment generation.
Aug 1989	The second Director, Dr EF Tacke, takes charge.
Aug 1990	The First Quinquennial Review of the Centre's organisation and programme activities by an international panel of experts recommends important changes in ICIMOD's governance structure and management.
Sep 1990	International Symposium on Sustainable Strategies for Sustainable Agriculture
26/27 Jun 1991	First Donor's Meeting and establishment of the ICIMOD Support Group
Nov 1992	The Government of Nepal provides ICIMOD with 30 hectares of land at Godavari, Lalitpur for the demonstration of practical programmes supporting integrated mountain development.
Dec 1993	ICIMOD completes 10 years.

Mar 1994	Mr Egbert Pelinck takes charge as third Director General.
Dec 1994	Conference on Sustainable Development of Fragile Mountain Areas of Asia is held in Kathmandu with the support of SDC and FAO.
Jan 1995	The Regional Collaborative Programme (RCP) for the Sustainable Development of the Hindu Kush-Himalayas, Phase I is launched to facilitate regional cooperation with a view to promoting the wellbeing of mountain people by overcoming poverty, inequality, and marginality.
Feb 1995	The Second Quinquennial Review (QQR) takes place and the committee comments that, "If ICIMOD did not exist, it would have to be created".
Nov 1995	The Asia Pacific Mountain Network (APMN) is established at ICIMOD.
Jan 1996	ICIMOD sets up its first internet network infrastructure – a local area network.
Mar 1997	ICIMOD organises a pictorial exhibition on the biodiversity of the Indian Himalayas and the trans-Himalayas.
Mar 1998	A regional workshop on the role of self-governing institutions in community forestry management in the Hindu Kush-Himalayas is held in Kathmandu in collaboration with the Association of District Development Committees of Nepal and the Federation of Community Forestry Users of Nepal.
Jun 1998	An international conference on Sustainable Development of the Hindu Kush-Himalayan Region: Mountains 2000 and Beyond is held in Germany with the support of Germany and Switzerland to mark 15 years of continuing support to ICIMOD.
Jan 1999	Mountains 2000 and Beyond: The Second Regional Collaborative Programme for the Sustainable Development of the Hindu Kush-Himalayas (RCP-II) commences with a view to mainstreaming mountain development in the Hindu Kush-Himalayan region.
Dec 1999	A new Training Centre is inaugurated at the ICIMOD Demonstration Centre in Godavari donated by the Government of Nepal with a view to facilitate training on various technologies for sustainable mountain development.
Mar 2000	Dr Gabriel Campbell takes charge as fourth Director General of ICIMOD.

Jun 2001	The Third Quinquennial Review (QQR) of ICIMOD takes place to review RCP I and RCP II and chart out the future course of the organisation.
2002	The International Year of Mountains is celebrated.
May 2002	The Asia High Summit is held in Kathmandu with the support of the Italian Committee for the International Year of Mountains 2002 and FAO.
Dec 2002	The decision to construct ICIMOD's Headquarters is made at the Bhutan Board meeting.
Jan 2003	A new strategy for the next five years entitled 'Partnership in Mountain Development: Securing the Future of the Hindu Kush-Himalayas' is developed with a view to securing sustainable livelihoods for mountain people.
Feb 2003	An International Conference on the Conservation of Himalayan Biodiversity for Human Welfare is held in Kathmandu.
May 2003	Work on the new Headquarters at Khumaltar starts after the construction contract is awarded on 20th May 2003.
Dec 2003	ICIMOD celebrates its 20th Anniversary and organises a 20th Anniversary special symposium.
Dec 2004	ICIMOD's Headquarters at Khumaltar is completed and inaugurated.
Jul 2006	The Fourth Quinquennial Review (QQR) is undertaken to review ICIMOD's work and set the future direction.
Sep 2006	A regional workshop on Policy Priorities for Sustainable Mountain Development is held.
Oct 2006	The ICIMOD-China National Committee Secretariat is inaugurated.
Nov 2006	The Pakistan Country Office is established.
Feb 2007	The Afghanistan Country Office is established.
Apr 2007	Dr Andreas Schild takes charge as the fifth Director General and planning for the new Medium Term Action Plan (2008-12) starts through iterative consultation.

Oct 2007	The Medium Term Action Plan (2008-12) is developed through consultations with the RMCs.
Dec 2007	The Board of Governors approves the new Medium Term Action Plan (2008-12).
Dec 2007	ICIMOD is invited and takes part in global events on climate change and water issues, including the 1st Asia Pacific Water Summit, Japan, and the Side Event on Climate Change Adaptation as a part of UNFCCC COP-13, Indonesia.
Jan 2008	Implementation of the new Medium Term Action Plan (2008-12) begins.
Apr-Jul 2008	ICIMOD becomes part of the global discourse on climate change and water through membership of accredited forums, namely provisional admittance by the UNFCCC in April, observer status by the IPCC in June, and observer status by RAMSAR in July.
May-Aug 2008	As a part of its 25th Anniversary activities, ICIMOD engages in raising awareness about the impact of global warming and climate change in the Himalayan region through the Eco-Everest Expedition (Nepal) and an international photo-exhibition entitled 'Himalaya—Changing Landscapes' (Sweden and Spain)
Jun 2008	First Board Executive Meeting is held in Kathmandu.
Aug 2008	ICIMOD highlights Himalayan water issues in a global forum at World Water Week in Sweden.
Oct 2008	Dr Andreas Schild, Director General, ICIMOD, receives the Sir Edmund Hillary Himalayan Environment Award from the Himalayan Environment Trust in recognition of his outstanding contribution towards the cause of environment and development in the Himalayan region.
Dec 2008	ICIMOD celebrates its 25th anniversary.

Annex 3: Members of the ICIMOD Board of Governors 1983-2008¹

Regional Board Members

Afghanistan

Eng. Ghulam Mostafa Jawad

(current, since 2003)

(Chairperson 2007)

Deputy Minister

Ministry of Agriculture, Irrigation and Livestock

Mr Mohammed Aman Aref (1995)

Director

Ministry of Agriculture

Mr Atta Mohammed Noorzad

General President

Ministry of Agriculture

Bangladesh

Mr Saikh Altaf Ali (current)

Chair (since April 2008)

Secretary

Ministry of Chittagong Hill Tracts Affairs

Mr Md. Abdus Sabur (2007)

Secretary

Ministry of Chittagong Hill Tracts Affairs

Dr A.K.M. Helal uz Zaman (2006)

Secretary

Ministry of Chittagong Hill Tracts Affairs

Bangladesh Secretariat

Mr SK. A.K. Motahar Hossain (2006)

Secretary

Ministry of Chittagong Hill Tracts Affairs

Mr Khan M. Ibrahim Hossain (2006)

Secretary

Ministry of Chittagong Hill Tracts Affairs

Mr Md. Shahjahan Majumder (2004 -2005)

Secretary

Ministry of Chittagong Hill Tracts Affairs

Mr Syed Mushtaq (2002-2003)

Secretary

Ministry of Chittagong Hill Tracts Affairs

Mr Chowdhury Mohammad Mohasin (2001)

Secretary

Ministry of Chittagong Hill Tracts Affairs

Mr Azm Shafiqul Islam (2001)

Joint Secretary

Ministry of Chittagong Hill Tracts Affairs

Mr Mahfuzul Islam (2000)

Secretary

Ministry of Chittagong Hill Tracts Affairs

Mr Md. Sakhawat Hussain (1999)

(Chairperson 1999)

Secretary

Ministry of Chittagong Hill Tracts Affairs

Mr Kazi Golam Rahman (1996 - 98)

(Chairperson 1998)

Secretary in Charge, Special Affairs Division

Prime Minister's Office

¹ Maintaining complete accurate records over 25 years, almost half with no electronic records, is a challenge. We offer our sincere apologies to any members of the Board of Governors whose names have been inadvertently omitted or misspelt.

Major General M.A. Rahman (1995)
Chittagong Hill Tracts Development Board
Government of Bangladesh

Major General Mahamudul Hassan (1991-1993)
(Chairperson 1992)
Chittagong Hill Tracts Development Board
Government of Bangladesh

Major General Abdus Salam (1988-91)
(Vice Chair 1988-1991)
Chittagong Hill Tracts Development Board

Bhutan

Mr Sherub Gyaltsen (current) (2007)
Secretary
Ministry of Agriculture

Dasho Sangey Thinley (2000-2006)
(Chairperson 2000/2001)
Secretary
Ministry of Agriculture

Lyonpo Dr Kinzang Dorji (1994-1999)
(Chairperson 1994 and 2000)
Minister
Ministry of Agriculture

Dasho Karma Letho (1988-1991)
Ambassador of the Royal Government of
Bhutan to India and Nepal

Mr Lakpa Tsering (1986)
Joint Director
Science and Technology

China

Prof Ding Zhongli (current) (2007)
Vice President
Chinese Academy of Sciences

Prof Li Jiayang (2004-2006)
Board Member Designate
Vice President
Chinese Academy of Sciences

Prof Sun Honglie (1994-2003)
(Chairperson 1995, 2001, and 2003)
Academician, Vice President,
Chinese Academy of Sciences

Prof Liu Dongsheng (1988 -1991)
Chinese Academy of Sciences

Dr Li Wenhua (1983 -1986)
(Vice Chair 1987)
FAO Regional Watershed Management Project
(reappointed 1994-1998)

India

Mr Vijai Sharma, IAS (current)
Secretary
Ministry of Environment and Forests

Ms Meena Gupta (2006-2008)
Secretary
Ministry of Environment and Forests

Dr Prodipto Ghosh (2003-2005)
Secretary
Ministry of Environment and Forests

Mr KC Misra (2002)
(Chairperson 2002)
Secretary
Ministry of Environment and Forests

Mr PV Jayakrishnan (2001)
Secretary
Ministry of Environment and Forests

Mr Vishwa Nath Anand (1997-2000)

Secretary
Ministry of Environment and Forests

Mr TKA Nair (1996)

(Chairperson 1996)
Secretary
Ministry of Environment and Forests

Mr NR Krishnan

(Chairperson 1995 to mid-1996)
Secretary
Ministry of Environment and Forests

Mr Alok Jain (1995)

Joint Secretary
Ministry of Environment and Forests

Mr R Rajamani (1992-1994)

Ministry of Environment and Forests

Mr DS Bagga (India Board Representative 1990)

Joint Secretary
Ministry of Environment and Forests

Mr Mahesh Prasad (1989)

Ministry of Environment and Forests and
Wildlife

Mr A Vaish (1989)

Secretary, Ministry of Environment and Forests
(in place of Mr K.P. Geethakrishnan)

Mr KP Geethakrishnan (1988)

Secretary
Ministry of Environment and Forests

Mr TN Seshan (1987)

Secretary
Ministry of Environment and Forests

Mr NN Jha (1984)

Joint Secretary
Ministry of External Affairs

Dr TN Khoshoo (1983)

Department of Environment

Myanmar**U Kyaw Htun** (current)

Deputy Director General
Planning and Statistics Department
University of Forestry

U Khin Maung Zaw (2006 - 2007)

Pro-Rector
University of Forest
Forest Department

U Soe Win Hlaing (2001- 2005)

(Chairperson 2004)
Director General
Forest Department

U Soe Kyaw (1998-2000)

Forest Department

U Than Nwai (1996 - 97)

(Chairperson 1997)
Deputy Director General
Department of Forests

Lt Col Thane Han (1995)

Director General
Ministry of Progress of Border Areas and
National Races and Development Affairs

U Tin Hla (1994-1995)

Director General
Forest Department

U Sre Kyi (1989-1994)

Director General
Forest Department

Nepal

Dr Pitamber Sharma (2008)

Vice Chairperson
National Planning Commission

Dr Jagadish Chandra Pokharel (2006 - 2007)

Vice Chairperson
National Planning Commission

Prof Dr Ram Prasad Chaudhary (2005)

(Chairperson Autumn 2005)
Member
National Planning Commission

Dev Raj Regmi (2004-2005)

(Chairperson 2005)
Secretary
Ministry of Population and Environment

Mr Lok Man Singh Karki (2003)

Secretary
Ministry of Population and Environment

Mr Mohan Bahadur Karki (2002-2003)

Secretary
Ministry of Population and Environment

Mr Mukti Narayan Shrestha (2001)

Secretary
Ministry of Population and Environment

Dr Govinda Raj Bhatta (2000)

Secretary
Ministry of Population and Environment

Mr Varun Prasad Shrestha (1998 - 99)

Act. Secretary
Ministry of Population and Environment

Mr Khem Raj Regmi (1995)

Secretary
Ministry of Education and Culture

Mr Lokendra Man Pradhan (1995)

Acting Secretary
Ministry of Education and Culture

Dr IP Upadhyaya (1984- 93)

(Chairperson 1993)
Secretary
Ministry of Education and Culture

Dr Prachanda Pradhan (1988-1991)

Professor of Public Administration
Tribhuvan University

Mr Madhukar SJB Rana (1987-1991)

Chairman and Project Manager
Man Maheswar Memorial Nursing Home Co.Ltd

Dr Narshing Narayan Singh (1983 - 1991)

Secretary
Ministry of Education and Culture

Dr Ratna SJB Rana

(Chairperson 1983 to 1986)
Nepal Academy of Science and Technology
(Vice Chairperson INTERIM 1982)

Prof Dor Bahadur Bista (1983-1986)

Tribhuvan University

Pakistan

Mr M Zia-ur-Rehman (current)

Secretary
Ministry of Food, Agriculture and Livestock

Mr Muhammad Ismail Qureshi (2004 -2007)

(Chairperson 2006)
Secretary
Ministry of Food, Agriculture and Livestock

Mr Salik Nazir Ahmed (2003)

Secretary

Ministry of Food, Agriculture and Livestock

Mr Shafqat Ezdi Shah (2002)

Secretary

Ministry of Food, Agriculture and Livestock

Mr Hafeez Akhtar Randhawa (2001)

Secretary

Government of Pakistan

Dr Zafar Altaf (1995- 99)

(Chairperson 1997/1998)

Secretary

Ministry of Food and Agriculture

Mr AQ Kazi (1987-1992)

(Vice Chair Dec. 1991 to April 1992)

Senior Scientific Adviser

Ministry of Science and Technology

Mr Hasan Nawab (1983-85)

Ministry of Science and Technology

Independent Board Members**CURRENT****Prof Bruno Messerli**Chairperson, Programme Advisory Committee
and Vice-Chair, Board of Governors

Professor

Institute of Geography

University of Berne/MAB

Switzerland

Dr Jacqueline A. AshbyResearch Coordinator, Andean Change Program,
International Potato Center (CIP)

Lima 12, Peru

Dr Elke Förster

GFA Consulting Group GmbH

Representative Office Hanoi/

Senior Consultant

Germany

Dr Amir Muhammed

Rector

National University of Computer and Emerging
Sciences

Islamabad, Pakistan

Dr Rob Visser

Ministry of Foreign Affairs

DCO (Chief Scientist)

Government of The Netherlands

The Netherlands

Dr Linxiu Zhang

Professor and Deputy Director

Center for Chinese Agricultural Policy

Chinese Academy of Sciences

Beijing, PR China

Dr AKM Jahir Uddin Chowdhury

Professor
Institute of Water and Flood Management
Bangladesh University of Engineering and
Technology (BUET)
Dhaka, Bangladesh

PAST

Dr Tone Bleie (2002-2007)

Chief, Gender and Development
UN ESCAP
Thailand (Norway)

Dr Anne Whyte (2000-2006)

(Vice Chairperson 2004)
Member ICIMOD Foundation
Mestor Associates, Canada

Dr Jamuna Sharan Singh (2002-2005)

Professor, Department of Botany
Banaras Hindu University, India

Mr Shoaib Sultan Khan (2002-2005)

Chairman
Rural Support Programmes Network (RSPN)

Dr Zhao Shidong (1997-2005)

Research Professor
Forest Ecology
Vice Chair and Secretary General
Scientific Committee of the Chinese Ecosystem
Research Network (CERN)
Chinese Academy of Sciences

Dr Ruth Egger – Tschäppeler (2001-2004)

(Vice Chair 2003)
Deputy Executive Director
Intercooperation, Switzerland

Dr Hans Gsaenger (1997-2002)

(Vice Chair 1998 to 2003)
German Development Institute, Germany

Prof Zhao Qiguo (1998-2001)

Chinese Academy of Sciences,
China

Dr Karin Inmann (1997-2000)

Managing Director
Eco Himal, Austria

Dr Brigitte Dekrout (2002)

Austria

Mr R Rajamani (1991-2000)

Secretary
Ministry of Environment and Forests
Government of India, India

Mr Jan Willem F. Cools (1997- 2000)

Agroeconomist Consultant, The Netherlands

Prof Shunji Murai (1999-2000)

Institute of Industrial Science
University of Tokyo, Japan

Dr Lynn Bennett (1995-98)

The World Bank

Dr Li Wen Hua (1995-97)

CISNAR
China

Prof Winfried Von Urff (1996-97)

Institute für Agrarpolitik
Technische Universität
(reappointed 1994-1997)

Dr AN Purohit (1992-97)

GB Pant Institute of Himalayan Environment
and Development
(reappointed 1994-97), India

Dr Harka Gurung (1996-97)

New Era Consultants, Nepal
(reappointed 1994-97)

Mr Remo Gautschi (1992-97)

(Vice Chair 1992 to 1997)
Swiss Development Cooperation (SDC)
(reappointed 1994-97), Switzerland

Dr Klasjan Beek (1992-97)

International Institute for Aerospace Survey
and Earth Sciences (ITC)
(reappointed 1994-1997)

Dr EE Clemens (1988-1991)

German Technical Cooperation (GTZ), Germany

Dr Gisbert Glaser (1983-1991)

Division of Ecological Science on Man and
Biosphere (MAB)
UNESCO, Paris

Dr Klaus J Lampe (1983-87)

German Technical Cooperation (GTZ), Germany

Dr Rudolf Hoegger (1983 -1986)

(Chairperson 1987 to 1991)
Directorate of Development Cooperation and
Humanitarian Aid
Federal Department of Foreign Affairs

Mr HP Spanier (1985)

Director
GTZ
Kathmandu

Annex 4: ICIMOD's Director Generals and Regent

Director Generals

Dr Andreas Schild

Switzerland

1 April 2007 – to present

Dr J Gabriel Campbell

United States of America

1 March 2000 – 31 March 2007

Mr Egbert Pelinck

The Netherlands

1 March 1994 – February 2000

Dr E Frank Tacke

Federal Republic of Germany

1 August 1989 – March 1994

Prof Dr Kenneth Colin Rosser

United Kingdom

April 1984 - 31 July 1989

Regent

Mr Peter Gueller

Switzerland

July 1982 - April 1984

Annex 5: ICIMOD Sponsors and Donors¹

Core Programme Sponsors

A. Regional

Afghanistan	India
Bangladesh	Myanmar
Bhutan	Nepal
China	Pakistan

B. Non-regional

Austria	Netherlands
Denmark	Norway
Finland	Sweden
Germany	Switzerland

Project Co-financing Sponsors²

Asia Pacific Network for Global Change Research APN/START	International Institute for Geo-Information Science and Earth Observation (ITC)
Asian Development Bank (ADB)	Italy (through IUCN)
Australia	Japan
Austria	MacArthur Foundation
Centre for Ecology & Hydrology (CEH), UK	Netherlands
Common Fund for Commodities (CFC)/FAO	Norway
European Space Agency (ESA)	Sweden
European Union	Switzerland
Ford Foundation (FORD)	United Nations Development Fund for Women (UNIFEM)
Germany	UN Educational, Scientific and Cultural Organization (UNESCO)
Interchurch Organisation for Development Cooperation, Netherlands (ICCO)	United Nations Environment Programme (UNEP)
International Development Research Centre (IDRC, Canada)	UN Food and Agriculture Organizations (FAO)
International Fund for Agricultural Development (IFAD)	United Nations Office for Project Services (UNOPS)
International Livestock Research Institute (ILRI)	University of Twente
International Potato Centre (CIP)	United States of America
	Wetlands International (WI)
	World Wildlife Fund (WWF)

¹ For all or part of the period 1983-2008

² Major sponsors only





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