

Strategic Framework on Climate Change Adaptation

Prepared by:

Mirjam Macchi

Michael Kollmair, Eklabya Sharma, Julie Dekens

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1 Executive Summary

ICIMOD's overall objective is to enhance resilience and support adaptation of vulnerable mountain communities and ecosystems to socioeconomic and environmental change. The goal of this framework is to allow a common understanding on what climate change adaptation is and how it can be promoted by ICIMOD and its partners in order to contribute to this overall objective.

Adaptation to climate change is understood as *'the adjustment of a system to moderate the impacts of climate change, to take advantages of new opportunities or to cope with the consequences'* (Adger et al. 2003). Mountain social-ecological systems are particularly vulnerable to climate change, they are characterised by a high degree of poverty, fragility, marginalization and low accessibility. Already today there is evidence of major changes affecting mountain areas and in particular the Hindu Kush-Himalayan (HKH) region with devastating consequences for mountain ecosystems and people as well as downstream areas which make mountain areas to 'hotspots' of climate change. On the other hand, mountain social-ecological systems also bear great potentials including a high degree of diversity of species and cultures, niches for specific activities and products as well as a great wealth of adaptation mechanisms which have been developed by mountain communities over the course of history in order to survive.

Even though there are major knowledge gaps existing with regard to climate change scenarios, adaptation needs to start now and there is an urgent need to identify so called 'no-regret strategies' which make mountain social-ecological systems resilient to future climate change. For this purpose, a range of strategic priorities at four different levels (local, national, regional and global) which are interlinked and interrelated and which build upon ICIMOD's long lasting experience have been identified in this framework: These priorities include the promotion of sustainable adaptive strategies which build upon existing adaptation mechanisms; livelihood diversification; disaster risk reduction; institutional strengthening and climate change mainstreaming; policy dialogue and enhancement of regional cooperation in particular in relation to transboundary water and biodiversity management as well as communication and awareness raising from the local to the global level with the goal to bring the HKH as a hotspot of climate change on the international climate change agenda.

2 Introduction

2.1 *Why a strategic framework on climate change adaptation?*

So far, the main focus of the international climate change debate has been mainly on coastal areas such as the Asian deltas, coastal cities and small islands as well as on sub-Saharan Africa whereas mountain systems still form a blank spot in many parts of the world and have yet to be recognized as ‘hotspots’ in relation to the impacts of and adaptation to climate change.

According to the IPCC (2007a), there is clear evidence that mountain areas, especially those situated in the Northern Hemisphere are among the ecosystems which are expected to be most severely affected by adverse impacts of climate change. Temperature rise is already today more accentuated in mountain areas than in lowlands and mountain glaciers and snow packs, feeding wetlands and creeks have already declined significantly and permafrost has degraded, leading to changes in land surface characteristics and drainage systems. These changes in temperature and in the hydrological cycle have not only severe impacts on the people dwelling in mountain areas but also on the people living in the adjacent lowlands that depend on mountain water resources and ecosystem services for domestic, agricultural, energy and industrial supply forcing them to adapt to these changes. Given the already existing changes affecting mountain areas and the expected future trends, there is an urgent need to bring mountains and especially the Hindu Kush Himalaya (HKH) region as a major ‘hotspot’ of climate change on the agenda of the international climate change community and to raise awareness on the needs of mountain communities and ecosystems in their struggle to adapt to these changing circumstances.

ICIMOD proposes to address the challenges related to climate change by closing existing knowledge gaps, generating and disseminating knowledge, increasing awareness and developing methodologies, strategies and policies with regard to climate change adaptation for the region and beyond.

2.2 *Purpose and objective of this strategic framework*

ICIMOD’s overall objective is ‘*enhancing resilience and supporting adaptation of mountain communities*’. In its strategic framework ICIMOD recognises that globalisation and climate change are major drivers influencing the stability of fragile mountain ecosystems and the livelihoods in mountain areas and sets the overall goals ‘*to increase the regional awareness and capacity needed to effectively reduce poverty among mountain people*’ and ‘*to mobilise and apply multidisciplinary research and analytical capacity to address emerging regional and global issues on environmental change*’.

This framework has been developed by a multidisciplinary working group in order to serve ICIMOD staff working on climate change adaptation as a reference and to give them guidance to define program activities. The overall objective of this framework is to

Provide a common understanding on what climate change adaptation is and how it can be promoted by ICIMOD and its partners in order to support vulnerable mountain communities and ecosystems.

The framework provides definitions of key terms related to climate change adaptation, describes the changes already affecting the region, summarises ICIMOD’s experience with

regard to adaptation to environmental change and provides strategic priorities at different scales on which ICIMOD is going to focus in the future.

3 Adaptation to climate change in the HKH region

3.1 Definition and types of adaptation

In this framework, we understand adaptation as *'the adjustment of a system to moderate the impacts of climate change, to take advantages of new opportunities or to cope with the consequences'* (Adger et al. 2003: 192). Adaptation to climate change occurs at different scales (local, national, regional or global) in physical, ecological and human systems. In this framework we focus on *social-ecological systems - linked systems of people and nature* (Resilience Alliance 2009). There can be different types of adaptation distinguished: adaptation can be anticipatory or reactive (biological adaptation is reactive whereas individuals and societies adapt to both observed and expected climate through anticipatory and reactive actions (IPCC 2007b)). Furthermore, adaptation can be planned (usually by public initiatives) or autonomous (usually by individuals or communities). In contrast to coping, which we understand as *'short-term actions to ward off immediate risk'*, adaptation to climate change involves long-term strategies to adjust to continuous or permanent threats or changes. In this context it should be noted that adaptation to climate change does not occur in isolation from the influence of other factors including social, political, environmental and economic variables which establish a location-specific context for human-environment interactions (Smithers and Smit 1997). Therefore, adaptation measures always need to be specific to the local context, which should be well understood by the ones promoting adaptation strategies.

Adaptation is facilitated by reducing vulnerability and vulnerability in turn is mainly determined by poverty, economic inequality, isolation and income diversity among others (Brooks et al 2005). Thus, in order to create resilient communities, activities cannot limit themselves exclusively to adaptation strategies which directly aim to mitigate climate change impacts but the underlying causes of vulnerability, in particular poverty overall, need to be addressed. Because in a mountainous context, poverty is widespread, adaptation to climate change is therefore often closely related with the traditional rural development and poverty reduction agenda.

Acknowledging that *even the most stringent mitigation efforts cannot avoid further impacts of climate change in the next few decades* (IPCC 2007b:747), ICIMOD focuses its work mainly on adaptation which is unavoidable and calls for immediate action. However, this does not mean that mitigation is neglected. Local mitigation efforts such as the promotion of REDD (Reducing Emissions from Deforestation and Forest Degradation), sustainable agriculture, sustainable energy use in rangelands or the promotion of hydropower, are understood as ways of a system to adapt to a changing climate while at the same time reducing greenhouse gas emissions.

3.2 Adaptation in mountain areas

According to Jodha (1992), mountain social-ecological systems are characterized by a great diversity of species and cultures, they provide niches for specific activities and products and

bear a great wealth of human adaptation mechanisms. Adaptation to environmental change is not a new concept in mountain areas but is a practice of the human species to survive. Mountain communities with their multiple livelihoods strategies have a long record of adapting to extreme environmental conditions, for example through trade, on and off-farm labour, crop diversification; different traditional resource management systems such as water and irrigation systems and soil conservation practices e.g. terracing slopes. Apart from these positive characteristics prevalent in mountain systems Jodha (1992) also identified constraining features of mountain areas including a high degree of fragility, marginality and limited accessibility. These typical (positive and constraining) characteristics of mountain areas have been summarised by Jodha as *mountain specificities*. Since the constraining *mountain specificities* including fragility, isolation and marginality are closely related to the determinants of vulnerability of social-ecological systems to climate change (see 3.1), mountain communities can be regarded as particularly vulnerable to climate change. On the other hand, the positive *specificities* identified by Jodha including diversity, niches and human adaptation mechanisms bear great opportunities for mountain communities in the view of climate change.

Consequently, adaptation to climate change in a mountainous context means to mitigate the negative characteristics of mountain systems and to capitalize on the opportunities. That is on the one hand to reduce fragility and marginalization as well as to improve accessibility of mountain socio-ecological systems and on the other hand to take advantage of mountain specific niches and diversity; to build upon existing human adaptation mechanisms and to make sure that these mechanisms are apt to the fast rate of climatic changes expected to affect mountain areas.

3.3 ICIMOD's experience with adaptation in mountain areas

Adapting to and mitigating the effects of climate change in the region are vital to the region's people and has ramifications for the global community. The immediate impacts of climate change are particularly harsh on the poor and vulnerable segments of society. ICIMOD intends to provide the knowledge and expertise needed to alleviate these consequences. ICIMOD's past work (Pre-MTAP II, 2008) was not explicitly focussing on climate change adaptation. However, we can use a lot of our experiences and learning in different fields like farming system research, community based natural resource management, and integrated watershed management as a basis for the ongoing and proposed intervention. This is in particular true when it comes to the implementation at the ground level. Climate change adaptation interventions are very close to classical rural development and poverty alleviation activities. They must focus on enabling people to use their assets and opportunities to create sustainable livelihoods in a challenging environment.

Since 2008 a study on adaptation in the situation of 'Too Much and Too Little Water' documented and assessed strategies mountain people use to cope with and adapt to variations in available water resources induced by climate change. Water served as an entry point to assess local adaptation strategies to (climate) change. These are often responses to a combination of stresses or changes - environmental, physical, economic, social, technological, institutional, and political - that people make rarely in response to climate stresses alone. Often, the economic and social effects or implications of climate stress are fundamental in triggering adaptive responses. This study presents people's efforts to respond, cope, and adapt to the current rapid changes, focusing in particular on the impact of climate-induced changes on water availability, which overlays other drivers of change.

During 2007-2008, ICIMOD conducted an ‘Assessment of Climate Change Vulnerabilities of the Mountain Ecosystems in the Eastern Himalayas’. The study highlighted the region’s vulnerability to climate change due to its ecological fragility and economic marginality. The assessment explored impact and the future projections of the changing climatic condition through a conceptual framework showing the critical linkages between biodiversity, ecosystem services and drivers of change and well-being of people.

A programme on ‘Enhancing Adaptation Capacity and Resilience of the Poor to Climate and Socioeconomic Changes’ with a strong focus on enhancing the knowledge on persistent poverty pockets in the mountains and propose relevant options for development interventions to increase mountain people’s resilience in the light of climate change adaptation has started in October 2010.

4 Context and challenges: The HKH region, a hotspot in relation to climate change

4.1 Current manifestations of changes and future trends in the HKH region

The HKH is an area of great biological and cultural diversity; it holds the world’s largest mass of ice outside the polar region and forms the origin of 10 of the largest rivers in Asia which provide water services for about 1.3 billion people living in the mountains as well as in the adjacent lowlands (Xu et al. 2009). The HKH also houses four of the 34 global biodiversity hotspots providing enormous biodiversity related goods and services. However, the HKH region is very sensitive to global climate change and is expected to be particularly affected by the consequences of climate change. There is evidence of major changes which are already today affecting the region: For example, progressive warming at higher altitudes in the Himalayas is three times more accentuated than the global average; the recession pace of glaciers, snow, and ice cover is more rapid than in other parts of the world; a trend of shifting monsoon patterns has been observed as well as changes of species composition and phenology have been reported, among other biophysical changes (Xu et al. 2009).

It is very likely that these trends in the region are going to continue and in certain cases to be more pronounced in the future. For example, the rapidly advancing reduction of glaciers and snow and ice packs is likely to continue. Advanced melting of permafrost is expected to lead to changes in land surface characteristics and drainage systems causing increasing soil instability. Furthermore, shifts in the hydrological cycle overall are expected to lead to periodic excessive or insufficient water supplies (floods and droughts) which may have harmful impacts on people’s livelihoods and on the ecosystems they depend on. Additional predicted future changes in the HKH region include an overall decline of biological diversity, changes in phenology, shifts in range of species, and changes in the composition and distribution of vegetation types, among others.

4.2 Prospected physical and social impacts of CC on the HKH region

The above described changes are in the long-term expected to lead to a more frequent occurrence of extreme events with flash floods and droughts with a tendency of having less water, with significantly changing mountainous ecosystems and species compositions. Continuing glacier melting increases the danger of glacial lake outburst floods (GLOFs). Fluctuations in snow and ice melt and shifting monsoon patterns are likely to lead to periodic excessive or insufficient water discharge of the rivers causing flood events and droughts. Additionally, more frequent and more intense extreme events are expected to result in water-related hazards and risks including landslides, debris flows and flashfloods (Xu et al. 2009). Continuing global warming is further expected to have severe implications on the great variety of ecosystem services provided by the HKH region, leading to major losses in species diversity especially of high alpine flora, used for food, medicine, clothing, craftwork, etc. by mountain communities (Byg & Salick 2009); changes in agricultural production systems challenging food security; depletion of important cultural, spiritual and recreational landscapes important for off-farm income opportunities such as tourism and the release of carbon into the atmosphere as a result of degradation of mountain forests, high alpine wetlands and alpine steppe which all serve as important carbon sinks.

As a result, mountain communities - due to their high natural resource dependency, poverty and marginalization - are going to be under increasing stress. Unpredictable precipitation patterns, water shortage or excessive rainfall, crop failure, landslides, outbreaks of pests and diseases, health problems, increased drudgery and in extreme cases loss of property and lives are depleting their livelihood assets, exacerbating their poverty and, as a consequence, reducing their capacity to adapt to future climate change given that adaptation to climate change involves high social and economic costs and is constrained by poverty and marginalization (Adger et al. 2003) However, these negative trends are balanced by the traditional resilience of mountain people. As discussed above, they dispose of a rich repertoire of strategies to cope with climate variability and extreme natural events which still have much relevance today (Jodha 1992); however, they are not well understood and may not anymore be adequate to cope with the magnitude of predicted future impacts of climate change. In this context, it should be noted that vulnerability to climate change and the capacity to adapt is not homogenously distributed across and within mountain communities. The poor and marginalized have historically been most at risk, and are most vulnerable to the impacts of climate change. Especially women, children and elderly have been found to be among the most vulnerable to climate change (IPCC 2007b).

In conclusion, climate change will have devastating impacts for mountain ecosystems and mountain people as well as downstream areas. The weakening of the ecosystem services of HKH will affect the livelihoods of up to one third of mankind. The HKH region and the river basins fed by the Himalayan head waters therefore have to be recognized as a hotspot in relation to climatic change. Adaptation has to start now and mountain social-ecological systems need to be strengthened in order to make them resilient to future climate change.

4.3 What are the knowledge gaps, key issues and challenges?

Even though there is clear evidence that the HKH region is going to be severely affected by adverse impacts of climate change, a great degree of uncertainty persists with regard to future climate change scenarios because of the complexity of mountain climate systems and because

the resolution of global and even regional climate change models is still too crude to deliver precise climate change projections.

The majority of scientific inquiry focuses still on the impacts of climate change in mountains, justified by the fact that the impacts on mountains will also have consequences for people. Consequently, there are still large knowledge gaps regarding how people in mountain areas did respond to climate change. With regard to climate change adaptation it is well known that mountain communities have been adapting to a changing environment over centuries, however, the concrete adaptation strategies and the mechanisms how adaptation occurs, the determining factors which favour or hinder adaptation as well as the limits of adaptation (social and cultural barriers, technological limits, physical and ecological limits, informational and cognitive barriers) and the economic and social costs and benefits of adaptation are not well understood. Furthermore, even though there have been efforts made in the region to better understand climate change adaptation, little has been published so far and a methodological framework which addresses all the above mentioned issues has yet to be developed. Literature review indicates that there are still considerable gaps in research and knowledge on vulnerability and responses to climate variability in mountain environments. Lack of such knowledge prohibits understanding to what extent people will be able to adapt to climate change in the future. Understanding people's responses to all change, including that which is not driven by climate-related changes, provides a good basis for understanding people's capacity to respond, as well as their limitations. There also appears to be a lack of human and institutional set ups and policy imperatives to tackle climate change issues.

Although climate change is high on the international development agenda, many national-level policy frameworks for adaptation and poverty reduction appear to run in parallel, despite a desire for more convergence. Many national strategies for poverty reduction and development have ignored climate change issues. Gaps and disconnects between climate adaptation and poverty reduction frameworks undermine efforts to cushion the poverty impact of climate change.

This links to the one of the main challenges: Climate Change Adaptation is a cross-cutting task that needs a holistic and intersectoral approach from the national development stakeholders. Collecting, providing, bundling, and packaging the relevant inputs for a mountain specific 'mainstreaming' of climate change adaptation and delivering them to the regional and national development stakeholders will be a challenging, but important task for ICIMOD.

Nevertheless, recognizing that there are knowledge gaps and methodological challenges it would be wrong to wait until more reliable scientific data sets are available. Given the changes which are already visible and the ones which are very likely to occur there is no time to wait for all the scientific explanations and proofs for current and expected changes. There is an urgent need to identify so called '**no regret**' strategies which will help people to adapt without knowing the exact magnitude of change and to attempt to close existing knowledge gaps.

4.4 Priorities for adaptation in the HKH region

4.4.1 Current adaptation programs in the HKH region

Climate change as to a global concern has only recently started to become an priority issue of policy makers in the region. The official response in the least developed countries takes the

form of National Adaptation Programmes of Action (NAPAs). Up till now (September 2009) Bangladesh, Bhutan and Afghanistan of ICIMOD's RMCs have submitted a NAPA. Nepal is currently in the process of developing one. India and China, even though they do not figure on the list of least developed countries, have developed national adaptation action plans following their own initiative. Pakistan and Myanmar have not yet submitted a NAPA.

NAPAs identify a list of priority activities to be implemented in the immediate future. In the following paragraphs, actions identified by the HKH countries are summarized.

National Action Plan on Climate Change (NAPCC) India:

Of the nine national missions that India has identified in its NAPCC, one mission is focusing on sustaining the Himalayan Ecosystem. It suggests to continue and enhance monitoring the Himalayan Ecosystem in order to preserve important ecosystem services, in particular freshwater reserves. It calls for transboundary collaboration and exchange of information to better understand ecosystem transformations (e.g. changes of the cryosphere) and their effects. The mission further stresses the importance of building the capacity of local communities to preserve the Himalayan Ecosystems. The following concrete action for preserving the Himalayan ecosystem have been identified: 1. Adoption of appropriate land-use practices and watershed planning actions for sustainable development of mountain ecosystems, 2. Adoption of 'best practice' norms for infrastructure construction in mountain areas, 3. Encouragement of cultivation of traditional crops and horticulture by promotion of organic farming enabling farmers to realize a price premium, 4. Promotion of sustainable tourism, 5. Consideration of unique mountain landscapes as areas of 'incomparable values' in developing strategies for their conservation. India has further gone a step forward by developing guidelines and best practices under the title "Governance for Sustaining Himalayan Ecosystem.

National Climate Change Plan (NCCP) China

China's NCCP which has been published in 2007 focuses mainly on the impacts of climate change and options for reducing greenhouse gas emissions whereas comparatively less attention has been given to possible adaptation measures. Even though the plan does mention changes which are currently affecting mountain areas in China including accelerated glacier retreat, reduction of the thickness of frozen earth in Qinghai-Tibet Plateau, upward shifting of mountain forest belts and decreasing volume of glacier fed mountain lakes, no concrete actions with regard to adaptation to these changes have been specified. Nevertheless, the following key activities addressing adaptation to climate change identified in the plan may also be of relevance in a mountainous context: Improvement of infrastructure to reduce water consumption in agriculture; breeding of stress-resistant varieties; prevention of aggravation of grassland desertification; strengthening the effective protection of existing forest resources and other natural ecosystems and enhancement of water resource management. In 2008 China has released 'Policies and Action for Addressing Climate Change'.

NAPA Bhutan

Bhutan's NAPA is integrated into the country's sustainable development 5 year planning. Since Bhutan's land surface is entirely situated in mountains, all the priority activities identified in the NAPA relate to a mountainous context. The majority of the nine identified priorities mainly focus on DRR: 1. Development of a disaster management strategy, 2. Artificial lowering of the Thorthomi Lake, 3. Landslide management, 4. Development of a

weather forecasting system, 5. Flood protection of downstream industrial and agricultural land, 6. Rainwater harvesting, 7. GLOF hazard zoning, 8. Installation of early warning system on Phu-chu River Basin, 9. Promotion of community based forest fire management.

NAPA Bangladesh

Bangladesh's NAPA mainly focuses on coastal areas and the communities living in a coastal setting. No priority action has been identified in the NAPA which applies to people dwelling in a mountainous context.

NAPA Afghanistan

Afghanistan's NAPA has only been submitted in September 2009 and no copy is yet available.

In summary, most of the NAPAs recognize mountain areas as a priority focus. So far only India and Bhutan have identified actions directly addressing climate change in mountains whereas the others only indirectly address issues related to mountain social-ecological systems. Overall, the NAPAs mainly focus on the biophysical impacts of climate change and suggest mainly technical short-term actions to mitigate and pay little attention on reducing socio-economic vulnerability and enhancing the mountain communities' inherent capacity to adapt. Hence, the NAPAs can be seen as a first step towards adaptation to climate change, however more detailed assessments of vulnerability and especially the underlying causes of vulnerability to climate change and determining factors of adaptive capacity would be necessary in order to formulate long-term mechanisms for more sustainable climate change adaptation of mountain social-ecological systems.

5 Strategic priorities for ICIMOD and its partners

In order to achieve resilient mountain areas, it is necessary to identify interventions at different levels to enhance the ability of countries, regions, communities and different social groups to adapt to new or changing conditions without becoming more vulnerable or shifting towards maladaptation. These interventions need be aligned with the Millennium Development Goals, in particular the goals No. 1, 3 and 7 as well as with national poverty reduction strategies. With its unique position in the HKH region and its vast experience in fostering adaptation to environmental change, ICIMOD can play a key role in supporting its RMCs and its partners in developing mountain specific adaptive strategies with the goal to build the resilience of mountain social-ecological systems to climate change.

In its efforts to capacitate mountain social-ecological systems to adapt to climate change ICIMOD will specifically focus on the most vulnerable and be eager to promote transboundary collaboration among its RMCs. ICIMOD will further aim to mainstream climate change within as well as beyond the institution, keeping other main drivers of change and the overall development goals in mind. It will strive to integrate climate change risks into all its projects and programmes in order to make them climate-proof and encourage its partners, national governments and ministries to work together and to make sure that they begin to consider how climate change risks will affect their policies, plans, projects and programmes.

Based on the assumption that sustainable and effective strategies to adapt to climate change are complementary and mutually reinforcing at different levels and that they should be

implemented by a mixture of stakeholders, ICIMOD will focus at four different levels - which are interdependent and interlinked: At the local/community level, at the national level, at the regional/transboundary level and at the international level.

Table 1 Key entry points for ICIMOD interventions at different levels

	Local	National	Regional	Global
Promotion of sustainable adaptive strategies	xxx	xx	x	
Disaster risk reduction	xx	xxx	xxx	x
Livelihood diversification	xxx	xxx	x	
Institutional strengthening and climate change mainstreaming	x	xx	xxx	
Communication and awareness raising	x	xx	xxx	x
Enhancement of regional cooperation		xx	xxx	x
Policy dialogue		xx	xxx	x

5.1 Local/Community based adaptation

Traditional coping and adaptive practices are the entry point at community level. A better understanding of these practices is needed in order to plan interventions to enhance and adjust them to new climatic parameters or complement them with modern technologies where necessary. At a local level, the following community based interventions addressing underlying causes of vulnerability; reducing the risk of possible adverse impacts of climate change and building upon the existing rich indigenous and traditional knowledge base with regard to adaptation to environmental change contribute to building the resilience of mountain communities:

- Promotion of sustainable adaptive practices:** ICIMOD through its partners is going to identify, pilot test and disseminate innovative and state of the art coping and adaptation mechanisms in a participatory way which are building on existing, successful traditional coping and adaptation mechanisms. Sustainable management of natural resources for maintaining the ecosystem goods and services will be critical in this context. For example, since water is one of the most constraining factor for rural, natural resource dependent communities, the development of water harvesting and storing systems as well as increasing water use efficiency will likely figure as key activities under this topic. The promotion of land management techniques and crops which are adapted to new environmental parameters will further be essential. Mountain communities are highly dependent on biodiversity resources; therefore adaptation related biodiversity resource management and utilization will be another important activity. During the identification and testing process of these mechanisms, women who are considered as being among the most vulnerable to climate change but who are also among the ones with a greatest potential to bring about change, shall

participate and a special emphasis shall be laid on the implications these identified mechanisms have on women's workload and drudgery.

- **Disaster risk reduction:** Creating awareness among mountain communities to potential risks and hazards is another key activity to reduce their vulnerability to climate change impacts. In this context, providing them with information will be crucial to enhance their capacity to adapt. It will further be important to motivate them to make use of their rich traditional knowledge regarding disaster risk preparedness and prevention and to make implicit knowledge explicit. Linking traditional knowledge systems with technologies, including weather information systems which reach the village level, early warning systems and the participatory development of risk and hazard maps will figure among the key activities promoted by ICIMOD and its partners to prepare mountain communities to adverse impacts of climate change.
- **Diversification of livelihood options to build resilience:** As discussed in chapter three, poverty, isolation and economic inequality figure among the key determining factors of social vulnerability. Livelihood diversification is therefore one of the most important strategies to build mountain communities' resilience. ICIMOD together with its partners is identifying, piloting and critically assessing innovative livelihood options which may contribute to strengthen the adaptive capacity of mountain communities. These options include the development of community-based mountain tourism, identification of options for effective use of remittances, development of payments for ecosystem services (PES) (e.g. through carbon funds, conservation of biodiversity or watershed management), hydropower development, and linking people to markets through value chain development of mountain specific products, among others. In the case of success, the learning from these pilots will be disseminated and the options will be scaled up at a regional level.
- **Institutional strengthening and climate change mainstreaming:** Adaptation to climate change never occurs in an institutional vacuum. Organisations (traditional, civic, public and private) play a vital role in climate change adaptation. They shape the impacts of climate hazards on the livelihoods of the communities. However, since climate change adaptation is a rather new concept to many organizations in the region, they may not be fully aware of the implications climate change may have on the livelihoods of the most vulnerable social groups and what role they should play in supporting these groups in the adaptation process. Also, not all mountain communities or social groups may benefit from or have access to these organizations. It is therefore a key priority of ICIMOD to better understand what the exact roles of different organizations at different levels with regard to climate change adaptation are, to identify ways how to strengthen them and to mainstream climate change among them.
- **Communication and awareness raising:** ICIMOD will support participatory impact and vulnerability assessments which will serve as a means to raise awareness within the communities themselves of the changes affecting their livelihoods and contribute at the same time to highlight their own capacities to adapt and emerging opportunities related to climate change. Furthermore, the learning from these impact and vulnerability assessments as well as from the pilot testing of adaptation strategies and innovative livelihood options will be documented and disseminated across the region.

5.2 National level adaptation

Most of the ICIMOD RMCs have already developed a NAPA or are currently in the process of developing one (see 4.4). In this context, ICIMOD can play an indispensable role in supporting its RMCs with its knowledge, experiences and capacities either to further develop and implement already existing NAPAs and to make sure that they specifically include activities which are geared towards the needs of mountain social-ecological systems or to write their NAPAs and to gear their contents towards the needs of mountain communities, in particular the most vulnerable.

With its expertise, ICIMOD can further intervene into the following topics at a national level:

- **Communication and awareness raising:** At a national level, awareness should be raised on the importance of the services provided by mountain socio-ecological systems but also on the fragility of these systems. Mountains should be recognized by national governments as hotspots of climate change and government entities should be motivated to put a special emphasis on the conservation of mountain social-ecological systems as well as to respond to the specific needs of communities, dwelling in these fragile systems in times of rapidly changing climatic and socio-economic circumstances. ICIMOD can support governments by providing them with important data derived from monitoring water, snow and ice cover and concentration of pollutants in the air as well as with socioeconomic data on the prevalence of poverty and vulnerability in the HKH region.
- **Policy dialogue:** Adaptation strategies need to be planned and need to be implemented through the development of policies. Therefore, existing sectoral policies need to be analysed for their responsiveness to the needs of mountain ecosystems and communities. Furthermore, governments should be supported and encouraged to introduce inter-sectoral policies which are addressing the underlying causes of vulnerability in order to enhance the adaptive capacity of mountain communities through e.g. the promotion of schemes for payments of ecosystem services, policies to tap funds from carbon sequestration and remittances, etc.
- **Promotion of sustainable adaptive practices:** Improvement of infrastructure (embankments, river training) and more importantly securing good governance of infrastructure, promotion of sustainable, climate proof land management techniques and integrated watershed management are additional fields where ICIMOD can serve governments as a knowledge broker and advisor and build the capacities of the respective ministries.
- **Disaster risk reduction:** Risk and hazard preparedness should not only be focused on the community level but should rather be based on a national strategy for disaster risk reduction. ICIMOD can serve national governments as a knowledge platform providing data, methodologies and building capacities with regard to risk and hazard mapping, development of early warning systems in a mountainous context and GLOF risk mitigation (monitoring of glacier lakes and lowering).
- **Diversification of livelihood options to build resilience:** Remittances derived from labour migration can be an effective strategy for livelihood adaptation and contribute to the sustainable reduction of poverty in the HKH. For the mountain poor, remittances are increasingly the most direct, immediate, and significant contribution

to their livelihoods and serve as a critical form of social insurance in times of stress (Hoermann and Kollmair 2009). On the other hand, Payments for Ecosystem Services (PES) can form another important source of additional income for vulnerable mountain communities. In particular payments for services related to carbon sequestration may become increasingly important for mountain communities in view of a globally fast growing carbon economy. ICIMOD explores and develops strategies to support the best use of remittances and PES and carries out country-specific assessments of remittance and PES related issues and opportunities to support national and regional level policy dialogue and sharing of good practices in order to enhance the resilience of the mountain poor to change.

5.3 Regional/transboundary adaptation

Climate change is a global phenomenon and impacts related to climate change cannot be bound to any national territories. Thus, regional (upstream-downstream) cooperation and collaboration are necessary to meet the challenges climate change is imposing on the HKH region and to improve the region's capacity to sustainably adapt to changing climatic conditions.

In this context ICIMOD will focus its activities on the following fields:

- **Communication and awareness raising:** ICIMOD as a regional organization is in the position to serve as a regional knowledge sharing platform which provides the different RMCs with vital information in order to increase their capacity to adapt as well as their sensitivity for the importance of transboundary collaboration in the field of climate change adaptation and disaster risk reduction. For this purpose, ICIMOD will facilitate the development of regional platforms and mechanisms in partnerships with RMCs for providing its member countries and partners with important climate related data sets which are derived from climatic weather monitoring stations and from water, snow and ice cover and pollutant monitoring systems as well as from vulnerability assessments, which go beyond the boundaries of countries. These regional data sets will be crucial to direct national and regional adaptation efforts into the right direction. Furthermore, they will contribute to a sound disaster risk reduction strategy across the region.
- **Climate change mainstreaming:** ICIMOD's Integrated Knowledge Management Programme regularly captures shares and disseminates state-of-the-art knowledge and information for the benefit of its RMCs and partners in the region as well as its mountain people and communities through various communication channels. Furthermore, ICIMOD hosts the Asia-Pacific Mountain Network (APMN) which connects regions and members through dialogue and networking. The network captures, enriches and disseminates information on mountainous development issues in and for the Asia-Pacific region.
- **Enhancing regional cooperation through policy dialogue:** Regional cooperation in the HKH to enhance the resilience of mountains and downstream areas requires policy dialogue between the different HKH countries. This is particularly important in the context of transboundary management of mountain ecosystem services such as freshwater or biodiversity. As mentioned in chapter four it is very likely that the availability of water will decrease and the diversity of species will be reduced as a

result of climate change. Since major rivers in the HKH region cross several countries and the habitats of species are not bound to any national territories, strategies for transboundary water and biodiversity management are needed. ICIMOD will support its member countries in developing action plans for transboundary water management and biodiversity conservation.

5.4 Global adaptation

- **Communication and awareness raising:** At an international level ICIMOD is represented in different bodies and forums and actively participates in international events and conferences where it endeavours to raise the awareness of the global climate change community for the HKH region as a hotspot of climate change with the goal to bring mountain social-ecological systems on the international climate change agenda.

6 Putting the strategic framework into practice

The different programs of ICIMOD - in accordance with their specific expertise and the strategic priorities described above and in collaboration with ICIMOD's partners and RMCs - support and pilot activities which contribute to enhancing the resilience and supporting adaptation of mountain communities to the rapid changes occurring in the HKH. In order to ensure synergy, interdisciplinarity and inter-programmatic collaboration and coordination the Climate Change Adaptation Resource Group (CARE) has been formed in August 2009. CARE is the body within ICIMOD responsible to discuss, integrate and provide adequate knowledge and practices on climate change adaptation issues and policies in each program and in the overall activities of ICIMOD.

The main responsibilities of the CARE include:

- Serving as a thematic knowledge oriented exchange and learning group
- Sharing experiences, best practices, methods, and lessons learnt on CCA issues and policies among the programs/divisions and Directorate
- Initiating whenever needed brown bags and other meetings within ICIMOD to share and discuss knowledge and information on CCA
- Identifying best practices to be further documented by ICIMOD's Integrated Knowledge Management Program
- Enhancing the capacity and knowledge of staff on various CCA related issues on a periodical basis
- Supporting, integrating and adapting new knowledge and ideas on the topic

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ANNEX I: Definitions of Key Concepts

So far there is no internationally recognized definition of key concepts related to climate change existing. Nevertheless, in order to ensure that everybody within ICIMOD is using the same terminology, the definitions of the following key concepts related to climate change adaptation have been agreed upon for the present framework.

Adaptation

Adaptation to CC is the adjustment of a system to moderate the impacts of CC, to take advantages of new opportunities or to cope with the consequences (Adger et al. 2003: 192)

Adaptive Capacity

Adaptive capacity is the ability of a system to adjust to climate change (including climate variability and extremes), to moderate potential damages, to take advantage of opportunities, or to cope with the consequences (IPCC 2007).

Climate change

“Climate change” means a change of climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods (UNFCCC convention text).

Coping

Short-term actions to ward off immediate risk, rather than to adjust to continuous or permanent threats or changes (SEI).

Mitigation

In the context of climate change, mitigation is a human intervention to reduce the sources or enhance the sinks of greenhouse gases (UNFCCC website).

Resilience

Resilience is the ability of a social-ecological system to absorb disturbances without losing its fundamental structure and function (ICIMOD, combination of different definitions).

Vulnerability

Vulnerability is the degree to which a system is susceptible to, and unable to cope with, adverse effects of climate change, including climate variability and extremes. Vulnerability is a function of the character, magnitude, and rate of climate change and variation to which a system is exposed, its sensitivity, and its adaptive capacity (IPCC 2007).