Adapting to Climate-induced Water Stresses and Hazards in the Hindu Kush-Himalayas

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The most forceful impact of a changing climate on the biosphere and society is through impact on the hydrological cycle. Increasing temperatures translate to more energy in the atmosphere, which in turn intensifies the water cycle. The result may be enhanced differences between wet and dry areas as well as enhanced seasonal differences. For the Hindu Kush-Himalayan region, climate predictions indicate that the already dry western Hindu Kush-Himalayas might become drier, some other areas might become wetter. However, it is still difficult to see clear trends in precipitation and climate predictions for this part of the world remain in their infancy. Nevertheless, it is generally accepted that we are facing an increased frequency and magnitude of high intensity rainfall events as part of an increased variability in the climate. There are already signs that this is happening in the Himalayan region.

Water-induced hazards are already a looming threat throughout the Hindu Kush-Himalayan region; every year riverine floods, inundations, flash floods, and droughts exact a heavy toll on human life, livelihoods, and economic prosperity. To some extent, societies have developed mechanisms to minimise the negative impacts on houses, infrastructure, crops, and access to safe drinking water when disaster strikes. However, adaptation strategies developed over generations might still not be enough if flood and inundation levels increase, the number of flash flood events doubles, or seasonal drought lasts longer.

These challenges highlight two urgent priorities. First, current adaptation strategies need to be documented and assessed in order to understand the mechanisms that people rely on for making their living in an inherently risk-filled environment. Second, these adaptation strategies need to be analysed in the light of greater uncertainties and accelerated changes, where climate is one important driver among many other drivers (e.g., globalisation), in order to understand their future and long-term sustainability. In addition, adaptation to new conditions requires a supportive policy environment. Thus for any external support to adaptation to be useful, it is of paramount importance to analyse the role of existing policies in influencing, positively or negatively, people's ability to adapt in a sustainable way.

ICIMOD has taken up the challenge to improve understanding of current adaptation strategies, for water stress their long-term sustainability, and the influence of current policies on these strategies, through a programme of documenting adaptation strategies in the region. Currently, five field teams are working in four countries (China, India, Nepal, and Pakistan) to document local adaptation strategies, and a team of policy experts is working in parallel to unravel the influence of existing policies at selected sites.

In the following, we highlight some preliminary findings from these studies, especially in relation to the role of uncertainties, scale, indigenous knowledge, and culture in influencing local adaptation strategies to climate-related stresses and hazards.

When climate sidelines current adaptation strategies

Parts of Kavre District in eastern Nepal that lie in a rainshadow area have had less annual rainfall during the last five years than usual. For generations, people have taken advantage of seasonal differences, cultivating vegetables using drip irrigation, planting

Wealthy farmers in Kabhre district, Nepal, use heavy machinery to dig trenches in the dry river bed to get water for irrigation (above); for others watering by hand is a short-term coping strategy (right)

crops with a low water requirement, using rain harvesting strategies and irrigation canals, and diversifying livelihoods by combining vegetables, paddy, and livestock. However, the increasingly dry conditions have stressed the system, with irrigation channels remaining dry through most of the year. Water can only be accessed by digging deep wells or through excavation of the dry river bed using heavy machinery – something that only wealthy farmers can afford. Poor households have to carry water by hand to their fields, and risk having to sell off livestock to compensate for lack of income from agriculture, or because they do not have enough water for them. The agricultural system was well-adapted to the prevailing conditions, but is not robust enough in the current context. Today farmers are merely coping, with differences between rich and poor households being enhanced. The inequity is reinforced by the absence of policies focusing on drought in general (the focus is on flood management) or regulating access to groundwater in particular. The local adaptation strategies are becoming non-functional in the changing climate. If the drought persists, the cost of the current coping strategies might be high. It may take some time for people to develop new adaptation strategies as these are often related to a combination of factors acting at different scales, like perceptions of change and external support.

Adaptation at different scales

The situation in Kavre illustrates the need for adaptation strategies at a local scale. But adaptation strategies need to be developed at regional and national levels too. At a regional scale, a river basin contains many different climatic regimes and local environments, each with its own local preconditions where water consumption should be optimised. It does not make sense, for example, to grow water-intensive crops in water scarce areas. The 'more-crop-per-drop' principle requires that crop selection is based on local water availability, while ensuring that the products are part of a regional market. Regional economic trade and transport of water in the form of products (virtual water), rather than costly transfer schemes for water itself, is an important adaptation strategy at the regional scale. Regional economic trade is still far from achieving its potential in the river basins of the Himalayan region.

There are also important adaptation mechanisms at the intermediate scale, at district or national level. Examples include infrastructure such as embankments for flood mitigation, or larger irrigation canals to support agricultural production in seasonally dry environments. Such macro-level installations require the mobilisation of larger resources and have to be addressed by district or national governments, although households and communities govern the actual use of water at the level of the agricultural field. Top-down structural adaptation strategies commonly show limits, however, e.g., problems of maintenance. Here, it is likely that increased funding mechanisms from the international community to address climate change adaptation can make a difference.

Adaptation to climate change needs to be addressed simultaneously at different scales for the strategies to be successful. Some aspects can be better addressed at the local scale, while others can be better addressed at regional and national levels (e.g., regional data sharing for flood mitigation, large infrastructures for flood prevention). In either case, there is a need to understand better the linkages or (mis)matches between top-down adaptation strategies and local adaptation strategies.

Indigenous knowledge and institutional arrangements

There are many examples of successful adaptation strategies at the community level. For example, in the Mulkhow Valley in Chitral, northern Pakistan, people have always faced water shortages during parts of the year. In this dry and vertical environment, very little land is available for settlement and agriculture. There are no perennial sources of water and people depend on rain feeding the streams. They have managed to adapt to recurrent drought through sophisticated traditional systems of water distribution for irrigation, including a system of water monitoring and maintenance of irrigation channels. To adapt to the regular shortage of water and unequal water rights, people also 'borrow' water from relatives or neighbouring communities. Since the early 1990s, with growing population pressure and more frequent and/or severe drought, water is increasingly being traded for in-kind products (fodder, fuelwood, poultry) or services (harvesting, weeding, irrigating) or for cash. The success of this traditional resource management system is based on strong social capital. In this case as elsewhere, informal institutions provide an important vehicle for fostering innovative adaptation practices. Any external intervention should build upon such traditional mechanisms when adapting to rapid changes.

A traditional water distribution and control structure or 'nirwalu' in Mulkhow, a drought prone area of Chitral, Pakistan.

Culture

Socio-cultural aspects (like age, gender, caste, political affiliation, beliefs, traditions) can have a positive or negative influence on adaptation strategies to floods and droughts. In Assam in North East India, different ethnic groups have adapted to floods in different ways. The Mishing communities, a tribal ethnic group, live along the rivers in stilt houses (chang-ghar) made mainly of bamboo. These traditional houses are well-adapted to the annual floods that these communities face; people can continue their daily lives relatively unaffected. The Mishing have been adapting their chang-ghar to changes in the frequency and intensity of floods by progressively raising the house stilts according to the level of the last highest flood. Those who can afford it now make cement stilts, which are stronger than bamboo and resist floods better.

People of other ethnic groups living nearby have adapted to the floods in a different way by building their houses on platforms in traditional Assamese style. Since these platforms are often not high enough to keep out high floods, they have created 'living platforms' inside the houses to stay on during the floods. They also take refuge in the granaries which are built on stilts and separate from the house. Although these houses are less well-adapted to the recurrent floods, they are often seen as symbols of modernity and affluence, and these groups do not wish to live in stilt houses which they associate with a 'lower' culture.

Cultural factors also influence access to livelihood diversification strategies. The Mishing communities have develop new adaptation strategies and diversified their livelihoods to meet the challenges of increasingly severe flooding. Although against their traditional lifestyle, the most vulnerable households have started to sell fish,

The Mishing community, in Assam, India, live in stilt houses (chang-ghar) made mainly of bamboo.

weave products, and produce local alcohol. Elders and rich households (who have other options) oppose these new practices, but for many it is the only way to spread risk, decrease vulnerability, and survive in a changing environment.

The above examples indicate the need to understand local traditions, practices, and beliefs before introducing interventions targeting climate change adaptation. Equally they show that cultural factors are not always rigid and there is room for flexibility. By working with communities and taking such factors into account, new practices can become sustainable.

Emerging activities

ICIMOD is also working in the fields of ecosystem services, livelihoods, and poverty reduction, as well as focusing on management of water resources and hazards, with the aim of supporting mountain people to adapt to change. Activities include documentation of adaptation strategies to climate change in rangelands and arid watersheds; assessment of the impacts of climate and socioeconomic changes and identification of pro-poor adaptation mechanisms; and studies on the linkages between climate change and gender issues. All of these activities will contribute to developing a better understanding of people's adaptation strategies to change in socio-ecological systems. People are vulnerable to a range of factors, and it is important to improve our understanding of mountain people's adaptation to climate change in the context of other drivers.

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